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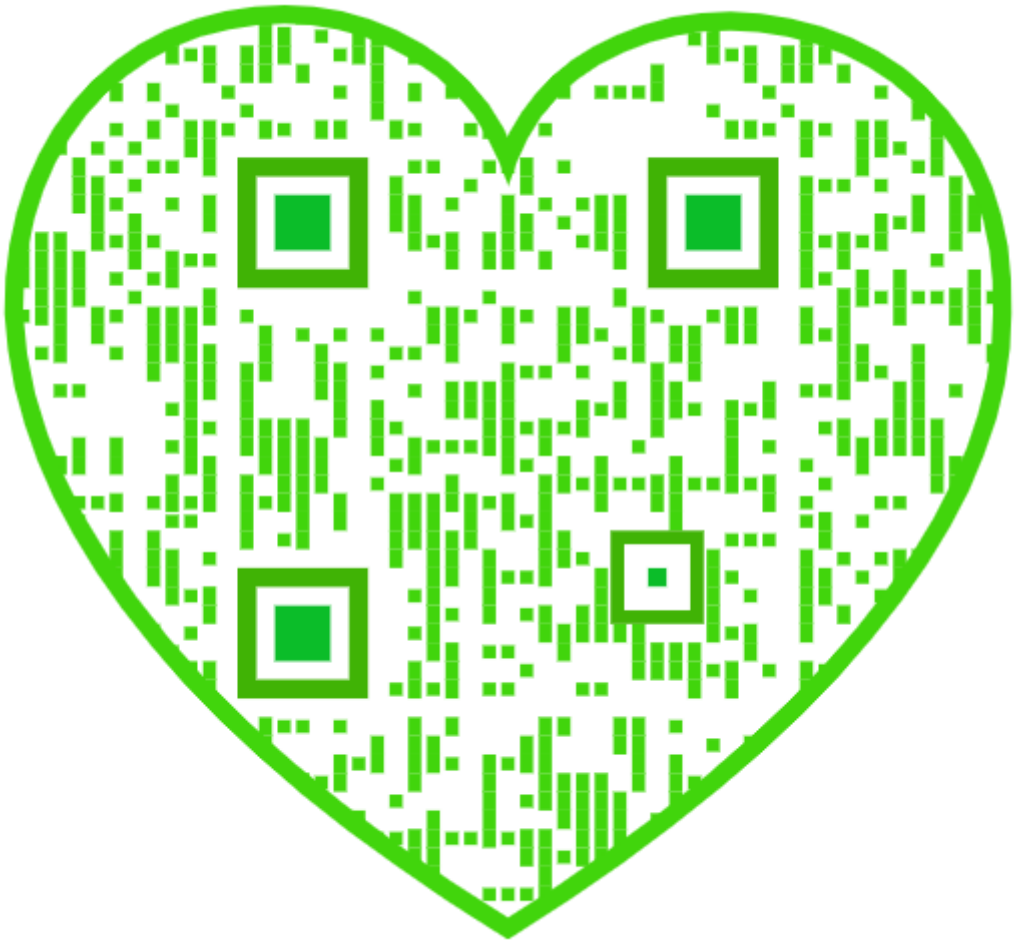

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THE HISTORY

OF THE

FIRST LOCOMOTIVES IN AMERICA.

FROM ORIGINAL DOCUMENTS, AND THE TESTIMONY OF LIVING WITNESSES.

BY

WILLIAM H. BROWN.

NEW YORK:
D. APPLETON AND COMPANY,
549 & 551 BROADWAY.
1871.

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DEDICATION.

To Peter Cooper, Esq., New York—

My dear Sir: It is my belief that your early and most successful experiments upon the Baltimore and Ohio Railroad in 1829–1830 proved that the locomotive could be used as a power upon the short-curved railroads in this country. The practicability of this was doubted at the time mentioned even by the most eminent engineers in Europe. I cannot, therefore, refrain from bestowing upon you the praise of having given the first impulse to the adoption of the locomotive in the United States, a fact which justly entitles you to the honor of being regarded as the "Father of the Locomotive System in America."

This, sir, is not the only benefit your energy, your wealth, and your liberality, have conferred upon your countrymen. The expenditure in acts of benevolence of large sums from your private fortune, acquired by your own industry and frugality, is an example to the youths of America; and in your "Institute" you will (after a long life of usefulness) leave an imperishable monument for future generations to dwell upon and admire.

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Will you permit me now, my dear sir, as a slight tribute to the respect and veneration I have ever felt for your many good deeds to your countrymen, to dedicate to you this humble effort on my part to record the history of the early locomotives in America, in which you took such an active and prominent part—a system which has resulted eventually in the development of the vast resources of our country, and given employment to many thousands of the mechanical and industrial classes of this community? With the hope, sir, that my wish upon this subject may meet with your cordial approbation, and that my work may be favorably received and prove instructive and interesting to the public,

I remain, dear sir,

Respectfully yours,

William H. Brown.

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PREFACE.

The author of this work, being familiar with railroads from their first construction, has, at much labor and expense, collected all the important facts in relation to their commencement and to the development of the locomotive-machine in this country. These facts have been obtained from the living witnesses who were the actors in those early events, and are presented in their own language in these pages. While making no pretensions to literary merit, he claims to have embodied in this volume all the facts of the early history of locomotives, in such a complete form as to satisfy the most skeptical. He therefore presents his work to the public with full confidence that his efforts to rescue from oblivion the names of some of the most distinguished pioneers in promoting the industrial progress

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of this nation will be kindly appreciated. To Mr. Peter Cooper and Mr. Jackson S. Schultz, of New-York City, in an especial manner, is he indebted for their generous assistance in enabling him to bring his task to completion.

New York, *August* 14, 1871.

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THE HISTORY OF

THE FIRST LOCOMOTIVES IN AMERICA.

CHAPTER I.

INTRODUCTION.

THERE is, perhaps, at the present day, no subject upon which the community at large is so poorly informed as the history of the first locomotives in America—in what year they were built, where they were constructed, and upon what railroad they were first introduced and employed in actual service.

Especially less informed upon this subject are the very men who, above all others, should be thoroughly conversant with all the particulars in the history of that wonderful machine—the actual means which now contribute so much toward the maintenance and employment of a large class of the industrial portion of our community; we mean the officers, engineers, firemen, machinists, mechanics, laborers, and, in short, all employés connected with railroad service. This melancholy lack of information can only be attributed to a want of an opportunity to obtain the requisite facts from some reliable source, where they are in such a form as would bring them within the reach of the masses of the community. True it is, volumes have

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been published, giving accurate accounts of the early experiments and subsequent improvements in self-propelling machines, or locomotives, in England; but these works are too rare, voluminous, and expensive, to be in general circulation, and entirely beyond the reach of a large class who are interested in the subject; and even then, they bring the history down only to a period anterior to the date of railroad enterprise in this country; while all the information upon the subject since that time (a period of a little over twoscore years in duration) seems to be wrapped in impenetrable mystery. To obviate, therefore, this difficulty for the future, and to give to the public all the information upon the subject from the most reliable sources, and also to place it in such a form as to bring it within the reach of every one, are the objects of the author of the present work, now offered to the public.

Another reason which influences the author in publishing his present work, arises from the fact that, within the short period of ten or fifteen years, and especially within the last few years, under a variety of forms, he has seen and read in our public journals nearly as many different accounts of the early locomotives in America, as the number of years which have elapsed since their first introduction, all of them purporting to be "true histories of the first engine ever built and run in America." But not one of these accounts, claiming priority for its different engines and roads, produces the slightest evidence to sustain their claim of being the pioneers in this great mechanical achievement, which within the last half-century has revolutionized the trade and commerce of the civilized world. One claim to the credit of having introduced the first American locomotive, we saw in an article pub-

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lished in the Philadelphia *Public Ledger*, of the 18th January, 1869. Another claim to the same honor, we saw in an article in the columns of the *Boston Advertiser*, January 28, 1869. These articles we will copy in full in our work, when we come in its pages to the proper place to describe early locomotives in America, when they were built, where constructed, and upon what railroad put into practical service.

Again, some seven or eight years ago, a lithograph picture representing a locomotive, and two cars filled with passengers, was issued from the lithographic establishment of Messrs. Sage & Sons, of Buffalo, and copyrighted by Thomas Jarmy. This lithograph (a copy of which is now before the author) purports to have been copied from an original picture in the possession of the Connecticut Historical Society. It has been widely circulated throughout the country, and is said to represent "the first locomotive train in America." The engine is said to be the "John Bull, an English machine; and the engineer, who is represented at his post upon the platform of the engine," John Hampson, an Englishman, etc.

Again, in 1870, this same original picture in the rooms of the Connecticut Historical Society was lithographed by a concern in Boston, styled the "Antique Publishing Company of Boston." In this lithograph the locomotive and train are represented precisely like the one executed in Buffalo, and are here for the second time said to be a sketch of the first locomotive and train in America, and the engine named the "John Bull," an English engine, and the engineer "John Hampson."

The original picture, now in the Connecticut Historical Society, was executed by the author of this work, and presented to the Society forty years ago.

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The full particulars respecting this original picture will be given hereafter; and the author, for the present, will only state that the original of the picture was not the English locomotive "John Bull," nor was the engineer on the occasion, John Hampson, an Englishman; but an American-built locomotive and an American engineer.

Such blunders and misstatements as we have just alluded to are calculated to mislead the public, and involve the early history of the locomotive in America in a cloud of obscurity; and the author unhesitatingly believes that, if the true history of this now indispensable machine is left unestablished for another half-century, we may find the great Union and Central Pacific Railroads credited by some (without a shadow of evidence, like others) with the introduction of the first locomotive upon a railroad in America, and with as much chance of establishing that claim as they no doubt have to sustain the credit of being the first in uniting the East with the far Western boundaries of our great continent by their interminable belt of railroad-iron, annihilating distance, just as the lightning-telegraph annihilates time.

The deep and intense interest always manifested, by railroad men in particular, when on frequent occasions the author has explained his knowledge of the facts connected with the early history of the locomotive in America, and the reliable sources from which his information was derived, often induced him to determine that, when a favorable opportunity presented itself, he would write out and publish a work like the present, but he has hitherto been prevented from carrying out his desire, from his isolated position, far away from the facilities requisite for such a task.

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These difficulties are now removed, and, the opportunity being presented, his long-cherished determination will no further be delayed. In compiling this history, all the authorities upon which his information is based will be set forth in such a manner that it must put at rest forever the oft-disputed question, "When and where was the first locomotive built and run in America, in the actual service of a company?"

These are questions oftentimes heard, when groups of engineers and other railroad-men are congregated together and discoursing upon their universal topic, the merits and achievements of their favorite machines; and how often is there one in the group who will pretend to answer the questions, and, if answered at all, how often are they answered correctly? There is scarcely a State in the Union (especially where railroads existed at an early day) which has not enjoyed the credit on these occasions of being the pioneer in the introduction of this most wonderful auxiliary to successful railroad transportation. Sometimes we have heard the credit awarded to the State of New York, sometimes to Pennsylvania, and as a matter of course oftentimes to the States of Massachusetts and Connecticut. Some, who profess to be well posted upon this point, claim the honor for the old Portage Railroad of Pennsylvania; while others, equally certain and conversant upon the subject, in their opinion, give the credit to the Germantown and Norristown Railroad; and so on, through the catalogue of railroads (not very voluminous at that early day): but none of these are correct. True it is, that several companies, even at an early day, had locomotives constructed for their use, and put them in practical service upon their several roads, those very roads just alluded to, but not, however, until the experi-

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ment had been tried and successfully inaugurated and reduced to a fixed fact in another quarter. Therefore, the honor of being the pioneer in having the first American locomotive constructed and put in actual service in the United States belongs elsewhere, as we are prepared to substantiate as we progress in our present work. If, however, in doing this, we should be compelled to descend too much into minutiæ, so as to bring upon us the charge of egotism from our readers, we will claim their forbearance in our anxiety to leave no stone unturned, to withhold no facts, and to bring to our aid every item, however trifling it may appear, to establish the truth. In recording the facts contained in this history, therefore, the author will accompany each position he may assume with all the evidence upon which his information is based. These authorities are from the statements of living witnesses, who are at this day (though far advanced in years) endowed with all the vigor of mind which characterized them in the early period of their lives, and are now enjoying an enviable share of the confidence and esteem of their fellow-citizens.

The names of John B. Jervis, Esq., Horatio Allen, Esq., Benjamin H. Latrobe, Esq., Ross Winans, Esq., and Peter Cooper, Esq., are well known and familiar to our railroad communities, as identified in the early days with railroad enterprise in America. To those of our readers, however, who may not be acquainted with the character and reputation of these accomplished engineers and gentlemen, we will briefly state that John B. Jervis, Esq., for many years a resident of Rome, in the State of New York, is one of the oldest (being now nearly seventy-five years of age) and most skilful engineers of the period of which we write. He was

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the chief engineer of the railroad that imported from England the first locomotive which turned a driving-wheel upon the American Continent. He has been engaged upon some of the most important works of improvement in our country, and his reputation as an accomplished engineer is widely known, not only in this country, but in Europe. Among the most important public works upon which Mr. Jervis was employed as chief engineer, we enumerate the Delaware and Hudson Canal and Railroad; the Mohawk and Hudson Railroad; the Saratoga and Schenectady Railroad; the Chenango Canal of New York; the Eastern Division of the Erie-Canal enlargement; the Croton Aqueduct; the Hudson River Railroad; the Michigan Southern and Northern Indiana Railroad; and the Pittsburg and Chicago Railroad. He was president of the Chicago and Rock Island Railroad, and consulting engineer of the Boston Water-works, and other important improvements. Mr. Jervis was also the inventor of the plan of having the truck under the front part of the locomotive, to assist in sustaining the weight of the boiler, and in giving direction to the machine in running upon curves, a plan now universally adopted, and found to be indispensably necessary in engines of eight or more wheels, and especially upon the short-curved railroads of America. Mr. Jervis is still living at Rome, New York, in the full possession of his vigor of mind, and we trust he may live for many years, to enjoy the reputation he has so richly earned by his valuable services to the railroad enterprise of America.

Delaware & Hudson.

Horatio Allen, Esq., is another eminent engineer of America, and his evidence contributes much valuable information to our history, which our readers will see from his various communications to the author.

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Mr. Allen graduated at Columbia College, in the State of New York, in 1823, commenced his professional life in 1824, as civil engineer with Benjamin Wright on the Chesapeake and Delaware Canal. In 1825 he was engaged on the Delaware and Hudson Canal as resident engineer under John B. Jervis, Esq., chief engineer, in 1827 resigned his connection with the Delaware and Hudson Canal, in order to visit England in search of professional information on railroad matters, that new era in intercommunication and transportation being then in process of development. During his visit to England, he was requested to take charge of the contract for the iron for the Delaware and Hudson Canal Company's coal-road, and also for three locomotives, being the first ever ordered and brought to this country. On his return, in 1829, Mr. Allen had charge of the fitting up and putting in operation the first locomotive, "the Stourbridge Lion," ever put on a railroad in this country, and alone he stood upon its platform on the first experimental trip, and his hand opened the throttle-valve upon the engine that turned the first driving-wheel in America.

In 1829 Mr. Allen was engaged as chief engineer on the South Carolina Railroad, running from Charleston to Augusta, Georgia, 136 miles. On this road was put the first one hundred miles of iron in one continuous line in the world. Another fact in connection with this road, and to the credit of Mr. Allen, is of interest: the road was built within the estimate of its cost.

In 1834 Mr. Allen went abroad, and was in Egypt nearly three years. On returning, in 1837, he was engaged as principal assistant engineer on the Croton Aqueduct, under John B. Jervis, the chief engineer. On completion of the aqueduct, Mr. Allen was one of the

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Croton Aqueduct commissioners, and its engineer for the introduction and distribution of the water. In 1842 Mr. Allen became one of the proprietors of the Novelty Iron Works in New York. In this establishment he continued as one of its managers and president until 1870, when the works were closed. Prior to Mr. Allen's connection with the Novelty Works, he was president of the New York and Erie Railroad, and was consulting engineer of the road at the period of its opening in 1845. In 1870 Mr. Allen became consulting engineer of the East River Bridge, now in course of construction, and which when completed will be looked upon as a wonder of the age. Of this great work Washington A. Roebling, Esq., is chief engineer.

To Benjamin H. Latrobe, Esq., we are also largely indebted for the early history of the locomotive enterprise upon the Baltimore and Ohio Railroad; for the drawing and full description of the sailing-car, invented by Mr. Thomas; and for the drawing of the little experimental machine, built to demonstrate the principle of the practicability of locomotives upon short curves, and the subsequent results from them.

Mr. Latrobe has constantly been in active employment upon some important public work in its engineer department. Among which we name the Baltimore and Ohio Railroad. In the service of this company he entered in 1830 as a member of the corps of engineers. In 1842 he was appointed chief engineer, and continued in that position until 1857. Since that time he has rendered the road much valuable assistance as consulting engineer. As chief engineer, Mr. Latrobe located and built the railroad from Baltimore to Havre de Grace, as a part of the Philadelphia, Wilmington and Baltimore Railroad, in 1835–'37, and the Northwestern

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Virginia Railroad from Grafton to Parkersburg (103 miles), from 1853–'57. He has been consulting engineer on several or on special occasions to a number of railway works; the most important were: the Hoosac Tunnel, Massachusetts; the Philadelphia, Wilmington and Baltimore Railroad (which office he now holds); the North Missouri Railroad; the Blue Ridge Railroad, in South Carolina; the East River Bridge; the Portland and Ogdensburg Railroad; the Hillsborough and Parkersburg Railroad; and the Columbus and Hocking Valley Railroad.

Mr. Latrobe is the chief engineer of the Jones Falls Improvement in the city of Baltimore; and is now completing the Pittsburg and Connellsville Railroad, from Pittsburg to Cumberland.

We will also quote freely from the letters of Mr. David Matthew to the author in 1859, and we will give in our work several certificates in reference to Mr. Matthew's character and ability as an engineer, and a reliable man. Mr. Matthew superintended the men fitting up the first English locomotive imported into this country, and he also had charge of the workmen fitting up the first, second, and third locomotives built in America—the last of which, after placing it upon the road, he continued to run as the regular engineer for a long time; and his testimony is entitled to all credit.

To Julius D. Petsch, Esq., now and for many years the chief of the mechanical department upon the railroad upon which the first American-built locomotive for actual service was run, we are indebted for many valuable particulars concerning that event.

To several other prominent and well-known gentlemen, whose letters and testimony will be found in the

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course of our narrative, we are indebted, and under great and lasting obligations.

Prominent among those private citizens is Mr. Peter Cooper, of New-York City, a gentleman well known throughout our country as one of the warmest friends and advocates for the intellectual improvement of the mechanical and laboring classes of our community. Mr. Cooper, as we will show in the progress of our work, was the pioneer, the very first to experiment upon the practicability of the locomotive system in this country. We will show that he stepped out from the desk of his mercantile office to become the first locomotive-builder in this country, and his success and efforts will be fully recorded as we progress in our work.

The original letters from these sources (in reply to the author's numerous inquiries for information) will prove deeply interesting to the reader, and richly repay the labor of their perusal, while, at the same time, they will fill up the chain of evidence, as it were, and point out the sources from which the author has gained the desired information for his work, and will be given in their proper places, word for word, as they were received.

CHAPTER II.

EARLY RAILROADS.

MANY persons, otherwise well-informed upon general topics, believe that railroads were constructed especially for locomotives, as the best-adapted road for the accommodation of that peculiar machine and its train of cars.

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They never call to mind that a locomotive is a modern invention, and, for want of access to works such as we have referred to, they are not informed that a railroad is an ancient institution (if we may apply such a term to such a subject). They never have dreamed nor ever imagined that this peculiar kind of road was invented and in use several centuries ago, but, like the great auxiliary, the locomotive, was very defective and simple in its primitive state, and since that time, like the latter, has been subject to vast and continued improvements.

Before, however, we enter upon the subject for which these pages were designed—"the history of the first locomotives in America"—it will not, we trust, be deemed inappropriate here to devote a small space in our work in describing the peculiar kind of road upon which the locomotive travels, now known universally as the railroad; and to such information as we have gathered of its origin and early progress.

Various devices have been employed, from the period when wheel-carriages were first used, for facilitating the movement over the ground in transportation. These devices, however, were mostly limited to the smoothing, levelling, and hardening the surface of the way. The early Egyptians, in transporting the immense stones they used in the erection of the vast pyramids from the quarries, learned the advantage of hard, smooth, and solid track-ways, and the remains of such, formed of large blocks of stone, are said to have been found on the line of the great road they constructed for this purpose.

The ancient Romans made also some approach to the invention of railroads, in the celebrated Appian Way. This was constructed of blocks of stone fitted

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closely together, the surface presenting a smooth and hard track for the wheels. In modern times such tracks or roadways were constructed in several European cities—London, Pisa, Milan, and many others.

The first instance on record of rails being used on highways was as early as the year 1630, over two and a quarter centuries ago. They were invented by a person named Beaumont, and built and used for the transportation of coal from the mines near Newcastle, in England.

Old Roger North alludes to railways as being in use in the neighborhood of the river Tyne in the year 1676, and he thus describes them: The rails of timber were placed end to end and exactly straight, and in two lines parallel to each other. On these bulky carts were made to run on four rollers fitting these rails, whereby the carriage was made so easy that one horse would draw four or five chaldrons of coal at a load.

We read of railways existing in Scotland in 1745, at the time of the Scotch rebellion. These railways were laid down between the Tranent coal-mines and the harbor of Cockenzie, in East Lothian. Improvements were made on these roads and continued until 1765, when they began to assume the forms of our present roads, even to the use of flanges upon the wheels; but up to this period no iron surface was ever heard of. The mode of constructing a railroad at that period was as follows: After the surface was brought to as perfect a level as possible—or incline, as the case might be—square blocks of wood, called sleepers, about six feet long, were laid two or three feet apart across the track; upon these two long strips of wood, six or seven inches wide and about five inches deep, were fastened by pins to the sleepers, and parallel to each other, but about

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four feet apart. Upon this wooden rail was spiked a projecting round moulding of wood, and the wheels were hollowed out like a pulley to fit upon the round surface of the wooden moulding upon the rails.

The first iron rails that we find any written account of were used at Whitehaven. They were cast-iron mouldings, similar in shape to the wooden moulding just described, and, like them, they were spiked down upon the wooden rail to receive the weight and pressure of the hollowed-out wheel, which, pressing entirely upon the moulding of wood, soon rendered it unfit for use. This iron substitute was a wonderful saving in this respect.

Thirty years after, in 1767, five or six tons of the same description of rails were cast at the Coalbrook Dale Ironworks, at Shropshire. St. Froud, a French traveller, describes these roads as being far superior to all other kinds of roads; that one horse, with perfect ease, could draw a wagon loaded with five or six hundred bushels of coal.

In 1776, the first iron rails we have any written account of were cast with a perpendicular ledge upon the outer side, in order to keep the wheels from running off the track, and after a while the ledge was changed to the inner side of the rail.

A railway of this kind was laid down at the Duke of Norfolk's colliery, near Sheffield. The road was torn up and destroyed by the laboring men of the colliery in a riot, and Mr. Curr, its builder and projector, had to save his life by flight, and concealed himself in a wood three days and nights to escape the fury of the excited rioters.

Objections were soon discovered in rails with flanges either on the outside or inside, from their liability to

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obstruction by stones or dirt, which would impede the progress and endanger the safety of the carriages.

A great step in advance was made in 1789, by William Jessop, in the construction of a railway in Loughborough, in Leicestershire, with the first cast-iron edge rail, with flanges cast upon the wheels, instead of upon the rail, as had been done a short time before.

In 1800, Mr. Benjamin Outram, of Little Eaton, in Derbyshire, introduced stone props, instead of timber, for supporting the ends or joinings of the rails. Taking the name from the projector, this kind of road was distinguished as the Outram road, and since that time, for brevity, all roads of this kind are called Tram-roads; as this plan was afterward applied to wooden roads, where long stringers were used, with the iron moulding as before described, and in our time the flat iron bar nailed upon the stringers, these roads are all familiarly known as Tram-roads.

Edge rails, as made by Jessop, were laid down in 1801, at the slate-quarry of Lord Penrhyn. The tire of the wheel was hollowed out to fit the projecting curve of the edged rail, but as the fit became soon too tight by wear, it was afterwards changed to a flat surface and rim of the wheel, and a flange around each edge of it. So great was this last improvement, that it was found that ten horses would do the work that had employed four hundred to do upon common roads.

Edge rails were soon after introduced at the collieries in England. They were made thin at the base and spread in thickness at the top. These rails, introduced in 1808, continued in use until 1820, when the machinery was invented for rolling iron into suitable shapes for rails. This was a great improvement, for, as cast-iron rails could only be made three or four feet

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long, requiring frequent joints, the material was more liable and subject to break, especially with heavy weights passing over it.

Up to this time the motive power was the horse. Many projects and schemes were talked of and proposed for propelling the wagons. Sails were suggested, and various other means were experimented upon, and speedily abandoned, but steam was the most favored, yet how to apply it was to be found out.

CHAPTER III.

FIRST HEAD OF STEAM.

It is recorded, 130 years before the Christian era, that the elder Hero of Alexandria is the first author who gives an account of the application of the vapor of boiling water as a power. Hero expressly ascribes the sounds produced by the statue of Memnon to steam generated in the pedestal and issuing from its mouth. Champollion, who is the highest authority on this point, declares that the Memnon of the Greeks is identical with Prince Amenophis II., one of the Egyptians who reigned at Thebes, 1,600 years before Christ. Therefore, if Hero's surmises of the Statue of Memnon are correct, we have an application of steam before the date of the exodus of the Israelites. Hero himself constructed a toy, one that would raise water like a fountain, keep a ball in equilibrium, and another giving a rotary motion to a ball; but he does not give the slightest hint that his invention or discovery could be

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made capable of any useful application, nor did he imagine that he possessed a knowledge of a power that was in future ages to produce such important results.

A knowledge of some of the properties of steam seems to have been understood during the flourishing periods and even to the decline of the Roman empire. In the reign of Justinian, the architect Artemius, of that empire, gave some experiments to demonstrate the power of steam or vapor of boiling water. He arranged several vessels containing water, each covered with the wide bottom of a tube, which rose to a narrower top, with pipes extending to the rafters of an adjoining house. When fire was kindled beneath the vessels, the rafters were raised from their positions, and the house shaken by the force of the steam ascending the tubes.

Cardan is the earliest modern author in whom we detect any hint of a knowledge of the mechanical power of steam. He gives a description of the eolipile, in a work dated 1571. The instrument showed how a current of air was made to follow the course of the steam that issued from the neck of the eolipile. Modern writers speak of various others who seemed to have ideas of the mechanical power of steam. The most worthy of notice are Baptista Porta, a Neapolitan, Brancas, a Frenchman, and De Coss. Brancas proposed to direct the current of air issuing from an eolipile upon the leaves of a wheel which, being set in motion, might serve to move machinery. This method was imperfect and wasteful, yet its attempt is deserving of praise, inasmuch as he is the first person who entertained a hope of realizing the vast benefits that steam has since conferred upon the world.

One Marion de Lorme, in a letter to the Marquis de-cinq Mars, in 1641, describes his visit to the mad-

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house, called the Bicêtre, at Paris, in which he saw, confined in a cell, a poor creature named Solomon de Cause, who seemed to be one of the first to conceive the idea, in 1615, of employing the steam or vapor of boiling water as a power by which both carriages on land and ships at sea could be propelled. Accompanying De Lorme in this visit to the mad-house, was the Marquis of Worcester. After relating many curious cases of madness, De Lorme writes that they saw a man named Solomon de Cause, looking through the bars of his cell. On seeing that he was noticed, Solomon exclaimed in a hoarse and melancholy voice: "I am not mad! I am not mad! But I have made a discovery that would enrich the country which would adopt it; but I am not mad! I am not mad!" "What has he discovered?" asked De Lorme of the guide. "Oh," replied the keeper, "something trifling enough, of course. The poor creature says that he has discovered a wonderful power in the use of steam from boiling water. He came from Normandy, about four years ago, to present to the king a statement of the wonderful effects that might be produced from his invention. The cardinal sent him away without listening to him. Solomon persisted, and followed the cardinal wherever he went, and finally so annoyed him with his discovery, that he had him shut up in the Bicêtre, as a madman."

Of all those who attempted to apply steam to useful purposes, the Marquis of Worcester fills the greatest space. His ideas of steam, and its applications, are to be found in a work called the "Century of Inventions," originally published in London, in 1663. The marquis, it is said, employed a mechanic thirty-five years to make models of machines for the power of steam. Many of these ideas appeared at the time absolutely

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impossible, yet they have been realized by modern inventors. In all his projects, the expansive power of steam alone was used.

That the steam-engine was not a mere theory in the conception of Worcester, but was actually put into operation, a recent discovery has settled upon positive testimony. The Grand-duke of Tuscany, Cosmo de Medicis, travelled in England in 1656. The manuscript of his travels remained unpublished until 1818. The following is an extract: "His highness," that he might not lose the day uselessly, "went again, after dinner, to the other side of the city, as far as Vauxhall, to see a machine, invented by my Lord Somerset, Marquis of Worcester. It raises water more than forty geometrical feet, by the power of one man only." Here, then, is a description of an engine in actual operation.

In all these projects the expansive power of steam was alone used; the steam was made to act directly upon the surface of the water; in this way the use of high steam is essential to success, and upon a large scale was attended with danger in the low state of the mechanic arts in those days, and various contrivances and improvements were introduced as in modern times. Consequently their necessity became visible, and as early as in 1680 the safety-valve, which has since been of such importance in the construction of steam-engines, was invented by Denys Pepin, a French Protestant. It was made in the following manner: A conical aperture was made in the lid or top of the boiler, and to this was fitted a conical stopper, pressed into the aperture by a weight suspended at the end of a lever. It was identical with the most usual form of safety-valves at the present day.

It has often been written that the power of steam

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was first discovered by the Marquis of Worcester, from observing the motion of the lid of a tea-kettle of boiling water. It may be so, but we are more inclined to believe that the marquis got his first idea of the power of steam at the time of his visit to the Bicêtre with Marion de Lorme, when he saw poor Solomon, and heard from his keeper the cause of his malady; then experimented and improved upon the hint. It does seem far more likely that this poor madman, as he was considered, and who it must appear had neither means nor friends to get him released from this thraldom, would be the one to observe the effects of the steam upon the lid of a tea-kettle than a proud English marquis. This, however, we will leave for some one else to determine, and resume our subject, although we cannot doubt our readers will excuse this digression.

The motion of a piston in a cylinder suggested itself to Pepin, first of all, as a method of adapting the expansive power of steam to produce mechanical effects.

The history of steam, applied to purposes of acknowledged utility, commences with one Savary, a Cornish miner, who in 1718 proposed the use of it to free the mines from water; for as early as 1710 Newcomen and Cawley had completed the first steam-engine in England, a patent for which had been issued in 1705.

Pepin constructed an engine for the Elector of Hesse in 1707. Savary's engine was confined to a single object, that of raising the water from the mines; and even this was done at a great disadvantage, from the imperfection of the principle, and the make-up of the machine; yet it was important as a step to the construction of more perfect machines, and even it was itself of some value when compared with the methods of freeing the mines from water which were at that period in use.

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In 1759, over a century ago, the subject of steam was first introduced to the mind of James Watt, and his first engine was made soon after, or in 1769. He was assisted by Dr. Robinson.

At a very early period the same Savary, before mentioned, proposed steam as a means of propelling carriages, but made no practical experiments.

The same James Watt in 1784 describes an engine for propelling carriages on common roads, but, being too much occupied in perfecting his condensing engine, nothing further was done by him toward constructing this locomotive.

Steam-engines, imperfect as they were at that early period, appear to have been directed first to the propelling of boats upon the water rather than carriages upon the land.

CHAPTER IV.

FIRST STEAMBOATS.

Worcester, in his "Century of Inventions," speaks of the capacity for rowing of his engine, used in raising water.

Savary proposed to make the water raised by his engine turn a water-wheel within his vessel, which should carry paddle-wheels acting on the outside; and Watt, as we are well assured, stated in conversation that, had he not been prevented by the pressure of other business, he would have made a steamboat.

In truth, before the time of Watt's improvement in his steam-engine, no modification by which steam was

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applied to useful purposes, as raising water, would have been able to propel vessels successfully. This is exemplified by evidences found recently in an ancient record, in which we have a description of a vessel propelled by steam. Blasco de Garay, an officer in the service of the Emperor Charles V., made, at Barcelona, in Spain, in the year 1543, an experiment in a vessel, which he forced through the water by apparatus, of which a large kettle with boiling water formed a conspicuous part.

De Garay was, therefore, not only the first inventor of a steamboat, but the first (not even excepting Savary) who was successful in applying steam to useful purposes. De Garay, however, was too far in advance of the spirit of the age to be able to introduce his invention into practice. His machinery was imperfect, and the recollection of his experiment would have been lost had not the record been accidentally found among the ancient archives of the province of Catalonia.

This experiment was, therefore, without any practical result, and may be looked upon as a piece of curious antiquarian research rather than as an event filling a space in the history of steamboats.

Among the early prime movers in seeking for the means of applying steam to vessels, we will name Genevois and the Comte d'Auxiron. The first of these, whose attempts date as early as 1759, is chiefly remarkable for the peculiarity of his apparatus, which resembled the feet of a duck, opening when moved through the water in the act of propulsion, and closing on its return.

The latter, D'Auxiron, also made an experiment in 1774, but his boat moved so slowly and irregularly that it was at once abandoned.

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In 1775 the elder Perrier, who afterward introduced the manufacturing of steam-engines into France, made an attempt in a steamboat, but was unsuccessful.

The Marquis de Jouffroy continued the pursuit of the same object. His first attempt was made in 1778, at Baume les Dames, and in 1781 he built upon the Saone a steam-vessel one hundred and fifty feet long and fifteen feet wide. The report of his experiment was made to the French Academy of Sciences, and was said to be favorable.

No successful experiment could be looked for until Watt made public his double-acting engine, and the improvements made in 1784 to keep up a continuous and regular rotary motion. To America, then, we are now to look for the first successful steamboat.

Conspicuous in the list of early experimenters in steamboats are the names of Rumsey and Fitch. Both constructed boats propelled by steam as early as 1783, and models were exhibited to General Washington.

Fitch was the first to try his plan, and in 1785 he succeeded in moving a boat upon the Delaware; and it was not until 1786 that Rumsey got his boat in motion on the Potomac. Fitch's plan was a system of paddles. Rumsey at first used a kind of pump, which drew in water at the bow and forced it out at the stern of his boat. He soon abandoned this plan of the pump, and employed poles set in motion by cranks on the axis of the fly-wheel of his engine, and intended to press against the bottom of the river. Fitch's boat was propelled through the water at the rate of four miles an hour. Rumsey's invention never came to any valuable results.

Next, after Fitch and Rumsey, came an ingenious gentleman named Miller, of Dolswinton, in Scotland,

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who, in 1787, made a substitute for oars, and applied wheels worked by men upon a crank; afterward steam was substituted by an engineer named Symington.

This boat was a double pleasure-boat upon a lake in his grounds at Dolswinton. The trial was so successful that Miller built a boat sixty feet long, and it is said that it moved upon the Forth and Clyde Canal at the rate of seven miles an hour; but the vessel suffered so much by the strain of the machinery that it soon became unsafe and in danger of sinking, and was set aside, and Mr. Miller's experiments were never resumed.

John Stevens, of Hoboken, next experimented in steam-vessels, in 1791. His first attempt was made in a boat with a rotary engine, but he soon substituted one of Watt's machines, and navigated his vessel five or six miles an hour. These experiments were continued up to 1807, much to the detriment of his fortune.

The project of Gerrevois was revived in England about this time by the Earl of Stanhope. An apparatus like the feet of a duck was placed in a boat, and with a powerful machine, but never gained a velocity over three miles an hour.

In 1797, Chancellor Livingston, of New York, built a steamboat on the Hudson River. He obtained from the Legislature the right and exclusive privilege, on condition that he would provide, within a year, a boat impelled by steam that would go three miles an hour. This he did not effect. In the year 1800 Stevens and Livingston united and built a boat to be propelled by a system of paddles, resembling a horizontal chain-pump, and with one of the engines of Watt, but, in consequence of the weakness of the vessel, the engine would get out of line, and the experiment did not succeed.

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We have often heard and seen it written that steamboats were invented and first run by Fulton. Such was not the case, as we have shown in the foregoing pages; but Fulton made the first successful experiment with a steamboat with side-wheels, which is the plan adopted ever since, excepting in propellers.

Fulton commenced his experiments in Paris, in 1803, upon the Seine, with a small vessel with side-wheels, driven by one of Watt's engines, adjusted for the purpose, and the experiment was a success. He soon after determined to construct a boat of a larger size, to be tried in the United States. This vessel was built in America; but as the workshops could not at that time construct the engine, one from Watt & Bolton was procured, and Fulton proceeded to England to superintend its construction. The engine arrived in New York early in 1806, and the vessel was set in motion in the summer of 1807. The success of this experiment is well known, and from that period steam-vessels have continued to increase in size and speed, from the humble efforts of these early experimenters, until they now assume the magnitude and magnificence of the floating palaces of the present day.

The first steam-vessel that traversed the ocean was the steamship Savannah, in 1817, and this early effort demonstrated the principle that steamships could be used upon the sea. The Savannah may be looked upon as the pioneer, whose path has since been followed by some of the largest and most magnificent specimens of naval architecture in the world.

Though steam, in its application to navigation, had been progressing rapidly, and even as early as 1807 attained such a degree of usefulness as to cause it to be looked upon as a fixed fact, yet its application in fa-

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cilitating intercommunication upon the land had not been developed during a quarter of a century afterward.

CHAPTER V.

FIRST STEAM-CARRIAGE.

The first actual model of a steam-carriage, of which we have a written account, was constructed by a Frenchman, named Cugnot, who exhibited it before the Marquis de Saxe, in 1763. He afterward, in 1769, built an engine to run on common roads, at the expense of the French monarch. As it is the first steam-carriage of which we have any written account, and believing that it would prove interesting to our readers, we copy this description of it from Appletons' Journal of Popular Literature, Science, and Art, August 17, 1869, as follows: "One of the earliest efforts in the way of steam locomotion was the engine of Cugnot, of France, designed to run on common roads. His first carriage was put in motion by the impulsion of two single-acting cylinders, the piston of which acted alternately on the single front wheels. It travelled about three or four miles an hour, and carried four persons; but, from the smallness of the boiler, it would not continue to work more than twelve or fifteen minutes without stopping to get up steam. Cugnot's locomotive presented a simple and ingenious form of a high-pressure engine, and, though of rude construction, was a creditable piece of work, considering the time. He made a second engine, with which several successful trials were made in the streets of Paris,

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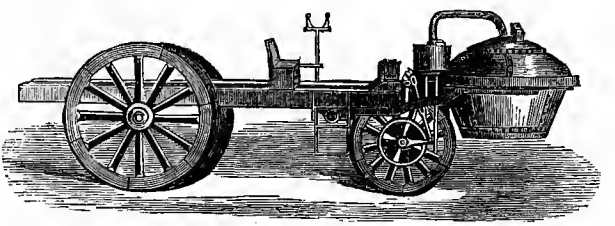
which excited much interest. An accident, however, put an end to his experiments. Turning the corner of the street one day, near the Madeleine, when the machine was running at a speed of about three miles an hour, it upset with a crash, and, being considered dangerous, was locked up in the Arsenal. Cugnot's locomotive is still to be seen in the Museum of the Conservatoire des Arts et Metiers, at Paris, and is a most interesting relic of early locomotion."

FIG. I.



CUGNOT'S LOCOMOTIVE, 1769.

In 1784 William Symington conceived the idea of steam being applied to propelling carriages, and in 1786 made a working model, but soon gave it up, and nothing was ever after heard of the project.

The first English model of a steam-carriage was made in 1784, by William Murdoch; this model was upon the principle of the high pressure, and ran on three wheels (for common roads, of course). It worked to admiration, but nothing further was ever done to bring the idea into a more practical form.

A few years after, Thomas Allen, of London, published the plan of a newly invented machine for carrying goods, without the use of horses, and by the use of steam alone for the motive power. His plan was to have cogged wheels to run upon cogged rails. The plan was all that was ever brought out.

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In 1801 Oliver Evans, of Philadelphia, a millwright, who had entertained the idea, as early as 1772, of propelling wagons by the action of high steam, was employed by the corporation of that city to construct a dredging-machine. The experiment was of a most remarkable character. The machine was, as you may term it, an amphibious affair. He built both the vessel and the machine at his works, a mile and a half from the water. The whole weighing 42,000 lbs., it was mounted upon wheels, to which motion was given by the engine, and moved without any further aid from the shop to the river. After the machine was in its proper element, a wheel was then fixed to the stern of the vessel, and the engine being again set in motion, she was conveyed to her designed position. Here is the first propeller. As late as the year 1800, wooden or tram roads were general in all the coal and mining districts in England, using horse-power for the means of transportation of their coal or ore from the mines to the point of shipment.

The first idea and proposition to introduce the railroad, imperfect as it then was, for the transportation of goods and for commercial purposes generally, and to be used as a highway between one city and another, as at the present day, was made before the Literary and Philosophical Society of Newcastle, England, by Mr. Thomas, of Denton, on the 11th February, 1800. The same idea was taken hold of in 1802, by a Mr. Edgeworth, who urged the same plan for the transit of passengers. He urges that stage-coaches might be made to go at six miles an hour, and post-coaches and gentlemen's travelling-carriages at eight miles an hour, with one horse alone. He also suggested that small stationary engines placed from distance to dis-

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tance might be made, and by the use of endless chains draw the carriages, at a great diminution of horse-power.

These ideas of Mr. Thomas were followed by a recommendation from a Dr. Anderson, of Edinburgh, a friend and co-laborer with Watt in his experiments upon the improvements in steam-engines. The doctor dilated upon the subject with great warmth and enthusiasm. So apparently extravagant were his views upon this his favorite topic considered, that many of his friends thought his mind had become affected. "If," said he, "we can diminish only one single farthing in the cost of transportation and personal intercommunication, and you at once widen the circle of intercourse, you form, as it were, a new creation—not only of stone and earth, of trees and plants, but of men also; and, what is of far greater consequence, you promote industry, happiness, and joy. The cost of all human consumption would be reduced, the facilities of agriculture promoted, time and distance would be almost annihilated; the country would be brought nearer to the town; the number of horses to carry on traffic would be diminished; mines and manufactories would appear in neighborhoods hitherto considered almost isolated by distance; villages, towns, and even cities, would spring up all through the country; and spots now silent as the grave would be enlivened with the busy hum of human voices, the sound of the hammer, and the clatter of machinery; the whole country would be, as it were, revolutionized with life and activity, and a general prosperity would be the result of this mighty auxiliary to trade and commerce throughout the land."

How perfectly true were these arguments of Anderson, and how his predictions have been verified even in

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our own State! What else could have developed the boundless wealth of our mountain-regions but the introduction of the railroad system and its powerful auxiliary the locomotive, by which means their hitherto inaccessible fastnesses have been penetrated, and access thereto made comparatively easy; while their vast resources of wealth in lumber, coal, minerals, and oil, have been brought nearer to a market, and, but for this system of transportation, they would to this day have been locked up in impenetrable mystery in the deep recesses of the mountains?

CHAPTER VI.

TREVITHICK'S ENGINE.

While these propositions were developing, one Richard Trevithick, a foreman in a Cornish tin-mine, prompted, no doubt, by seeing the model engine which Murdoch had constructed, determined to build a carriage to run on common roads, and a Mr. Vivian joined him in the enterprise. They took out a patent in 1802. A description of this machine will not be uninteresting to our readers:

This steam-carriage resembled a stage-coach, and was upon four wheels. It had one horizontal cylinder, which, together with the boiler and furnace-box, was placed in the rear of the hind axle. The motion of the piston was transmitted to a separate crank-axle, from which, through the medium of spur-gear, the axle of the driving-wheel derived its motion. It is worthy of note

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that the steam-racks and force-pumps, as also the bellows used in generating combustion, were worked off the same crank-axle.

This was the first successful high-pressure engine constructed on the principle of moving a piston, by the elasticity of steam, against the pressure of the atmosphere, and without a vacuum. Such an engine had been described by Leopold, though in his apparatus the pressure acted only on one side of the piston, while in Trevithick's and Vivian's engine the piston was not only raised but likewise depressed by the steam. This was original with them, and of great merit.

This kind of carriage on common roads was tolerably successful. It was exhibited at the city of London, and attracted great crowds to witness its performance; and it drew behind it a carriage filled with passengers. But it soon became obvious that the roads in England were too rough and uneven for the successful use of such machines, and it was soon after abandoned by Trevithick as a practical failure.

Trevithick next turned his attention to the invention of a steam-carriage or locomotive, to run upon the tram-roads then in general use in England; and in 1804 he commenced his machine; in the same year it was completed and tried upon the Merthyr-Tydvil Railway, in South Wales. On this occasion it succeeded in drawing after it several wagons containing ten tons of bar-iron, at the rate of five miles an hour. The boiler of this machine was cylindrical in form, flat at the ends, and constructed of cast-iron. The furnace and flues were inside the boiler, in which a single cylinder of eight inches in diameter and four feet six inch stroke was immersed upright. Although this locomotive, when tried upon the railroad as above stated, suc-

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ceeded in drawing a considerable weight, and travelling at a fair speed, from other causes it proved like his first steam-carriage, a practical failure, and was soon abandoned. This experiment, however, may be considered as the first attempt to adapt the locomotive to service upon a railroad of which we have any written account.

The great difficulty and obstacle which at that early day did more than any thing else to retard the successful progress of the locomotive for railroad purposes, was the idea that, upon the smooth surface of a rail or iron plate then in use, the smooth surface of the driving-wheel would not have adhesive power to cause the engine to move forward, much less have a sufficient friction to enable the machine, not only to go ahead itself, but to draw a weight of carriages behind it. To remedy this evil, Trevithick recommended, and caused to be placed upon the surface of the driving-wheels of his machine, heads of bolts and numerous grooves, to produce the required adhesion. It proved successful, but produced a succession of jolts very trying upon the cast-iron plates upon the roads upon which the experiments were tried, as well as upon the machine.

In 1811 a Mr. Blankensop, of Leeds, took out a patent for a machine and rail adapted to each other: a rack or toothed rail was to be laid down along one side of the track, into which a tooth-wheel of his locomotive worked. The boiler of his engine was supported by a carriage upon four wheels without teeth, and resting immediately on the axles. These were entirely independent of the working-parts of the engine, and merely supported its weight, the progress being effected by the motion of the cogged wheels working on the cogged rail. This engine began running on the railroad from

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the Middleton collieries to the town of Leeds, about three and a quarter miles, on the 12th of August, 1812. For a number of years it was a permanent object of curiosity, and was visited by crowds of strangers from all parts. These engines (for several were afterward constructed) drew after them thirty coal-cars, loaded, at a speed of three and a quarter miles per hour, and were in use for many years, and may justly be considered as the first instance of the employment of locomotive power for commercial purposes.

Another curious experiment was tried in 1812, to overcome the want of friction upon the road and increase the power of the engine. A Mr. Chapman, of Newcastle, took out a patent for this invention. The plan was a chain stretched from one end of the road to the other. The chain was passed once round a grooved barrel-wheel under the centre of the engine, so that, when the wheels turned, the locomotive would, as it were, drag itself along the railway. The experiment was tried with an engine constructed for the purpose on the Heaton Railway, near Newcastle, but it was so clumsy in its action that it was soon abandoned.

But the most remarkable, extravagant, and amusing experiment of all, and one which must bring to the countenance of our readers at the present day a smile, was the one adopted by a Mr. Brunton, of the Butterby Works, Derbyshire, in 1813, who took out a patent for a machine which was to go upon legs like a horse. This contrivance had two legs attached to the back part, which, being alternately moved by the engine, pushed it before them. These legs, or propellers, imitated the legs of a man or the fore-legs of a horse, with joints, and when worked by the machine alternately lifted and pressed against the ground or road, propelling

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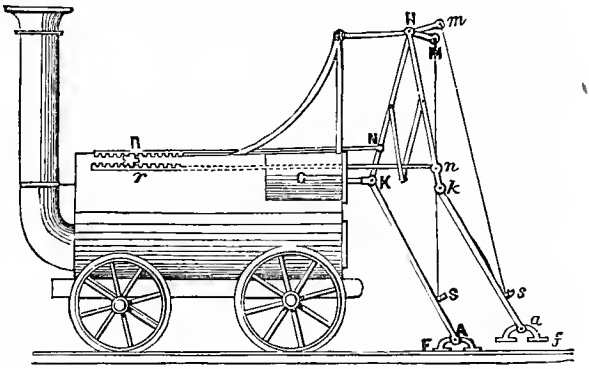
the engine forward, as a man shoves a boat ahead by pressing with a pole against the bottom of a river.

FIG. 2.



WILLIAM BRUNTON LOCOMOTIVE.

This contrivance was so singular and ingenious that we cannot refrain from giving a description of it, taken from a very interesting work upon road-making, by W. M. Gillespie, A. M., C. E.

The legs are indicated by H K F and H *k f*. H represents the hip-joint, K and *k* the knee-joints, A and *a* the ankle-joints, and F and *f* the feet. We will first examine the action of the front leg. The knee, K, is attached to the end of a piston-rod, which the steam drives backward and forward in the horizontal cylinder, C. When the piston is driven outward, it presses the leg K F against the ground, and thus propels the engine forward, as a man shoves a boat ahead by pressing with a pole against the bottom of a river. As the engine advances, the leg straightens, the point H is carried forward, and the extremity, M, of the bent lever H M, is raised. A cord, M S, being attached to S, the shin of the leg, the motion of the lever tightens the cord, and finally raises the foot from the ground, and prepares it

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to take a fresh step where the reversed action of the piston has lowered it again. The action of the other leg is precisely similar, but motion communicated to it from the first one. Just above the knee of the front leg, at N, is attached a rod, on which is a toothed rack, R. Working in it is a cog-wheel, which enters also a second rack, *r*, below it, which is connected by a second rod with point *n* of the other leg. When the piston is driven out and pushes the engine from the knee, the rack R is drawn backward, and turns the cog-wheel, which then draws the lower rack *r* forward, and operates on the hind leg precisely as the piston-rod does on the front one, and thus the legs take alternate steps, and walk on with the engine.

This locomotive or "mechanical traveller," as it was termed by its inventor, moved on a railway at the rate of two and a half miles per hour, with the tractive force of four horses. Mr. Brunton's machine, however, never got beyond the experimental state, for, on one of its trials, it unhappily blew up, killing and wounding several of the by-standers, was never repaired, but laid aside as one of the failures of the times.

These experiments, though failures in their results, were followed up by a Mr. Blackett, of Wylam, whose persevering efforts paved the way for the future labors of George Stephenson.

To make his experiments Mr. Blackett ordered one of the locomotives of the Trevithick patent, and also employed rack-rails and tooth driving-wheels like Blankensop's, and had his road altered for the occasion. This engine was the most awkwardly-constructed machine imaginable. It had a single cylinder six inches in diameter, and a fly-wheel working on one side to carry the cranks over the dead-points. The boiler was of cast-

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iron, and the weight of the whole was about six tons; a wooden frame was supported by four pairs of wheels, and a barrel of water placed upon another frame sustained by two pairs of wheels served as a tender. When all was ready, the word was given to go ahead, but the engine would not move an inch; when it was finally set in motion, it flew to pieces, and the workmen and spectators, with Mr. Blackett at their head, scattered and fled in every direction! The machine, or what was left of it, was taken off the road, and afterward a portion of it was used as a pump at one of the mines.

Mr. Blackett was not, however, discouraged. His next experiment was an engine with a single eight-inch cylinder, which was fitted with a fly-wheel, the driving-wheel on one side being cogged in order to enable it to travel on the rack-rail. This engine proved more successful than its predecessors, and, although it was clumsy and unsightly, it was capable of drawing eight or nine wagons loaded with coal to the shipping-point at Lemington; its weight, however, was too great for the road, and the cast-iron rails were continually breaking. Its work was by no means successful. It crept along at a snail's pace, sometimes taking six hours to go five miles to the landing-place. It was continually getting off the track, and there it would stick. Horses would then have to be sent out to pull it on the track. The engine often broke down; its pumps, plugs, and cranks would get wrong, then the horses again would be needed to drag the machine back to the shop. In fact, it at last got so cranky that the horses were frequently sent out to follow the engine to be in readiness to draw it along when it gave out. At last it was abandoned.

Notwithstanding the repeated failures, and the amount of money expended on these experiments, Mr.

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Blackett persevered. In 1813 he made an experiment with a frame upon four wheels, to determine the much-disputed point, the adhesive power of a smooth-surfaced driving-wheel upon a smooth-surfaced rail. Six men were placed upon this frame, which was fitted up with a windlass attached by gearing to the several wheels. When the men worked the windlass, the adhesion was found sufficient to enable them to propel the machine without slipping. This experiment settled the difficulty which was always thought to be in the way of the successful use of the locomotive upon the smooth surface of a railroad with smooth-surfaced driving-wheels, proving that rack-rails, tooth-wheels, endless chains, and legs, were useless requisites to the successful use of a locomotive with smooth-surfaced driving-wheels upon a smooth-surfaced railroad-track, and drawing loaded wagons behind it.

CHAPTER VII.

GEORGE STEPHENSON.

While Mr. Blackett was building locomotives and experimenting with them, George Stephenson, then enjoying a high reputation for his ingenuity and skill as a machinist, was deliberating in his mind on the possibility of locomotives being made and improved so as eventually to supersede the use of horse-power upon tram-roads; but the want of means, and the difficulty of obtaining skilful mechanics at that early day to do the requisite work, retarded him in his long-cherished idea of making a machine that would answer

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effectually the purpose for which the locomotive was intended. True it was that Blankensop's engine, built in 1813, had been in use upon the tram-way at Wylam, and improvements were subsequently made so that a machine had been constructed and run upon the tram-way between Kenton and Cox Lodge, which was enabled to draw after it sixteen loaded cars, of about seventy tons, at the rate of three miles an hour. Yet this engine, and others like it, were far from being perfect, or adapted to the purpose for which they were intended, being clumsy, cumbrous, and awkward, in all their movements. Mr. Stephenson saw one of these at work, and when asked by one of his companions what he thought of it, he replied that he "could make a better one than that;" and, to accomplish this, he devoted his whole mind and energies, the result of which we will show hereafter.

It will not, we trust, be deemed out of place to devote a small space in our pages to give, as briefly as possible, some of the early history of this afterward most distinguished engineer and machinist, who may be justly looked upon as the father of the locomotive system in England, now so successful and essential to its commerce and manufactures. His history may tend to impress upon the mind of any youthful reader and mechanic who may be now, as he once was, a poor boy, how a young man, by industry and perseverance in a good cause, may ultimately build up for himself a position which would lead eventually to eminence and fame.

George Stephenson was born on June 9, 1781, in a small colliery village called Wylam, on the north bank of the river Tyne. The tram-road between Newcastle and Carlisle runs along the opposite bank of the river from the coal-pits to the shipping-point. Robert

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Stephenson, the father of George, was a poor, hard-working man, and supported his family entirely from his own wages of less at first than, but afterward raised to, twelve shillings a week.

The wagons loaded with coal passed by Wylam several times a day. These wagons were drawn by horses; for locomotives had not been dreamed of by the most visionary of that early period. George's first wages were twopence per day, to herd some cows owned by a neighbor which were allowed to feed along the road; to watch and keep them off the tram-road, and out of the way of the coal-wagons; also, to close the gates after the day's work of the wagons was over.

The old mine being worked out, the Stephenson family removed to the new opening at Dudley Burn, where Robert, the father, worked as fireman. George's first work about these mines was at what is known as a picker. His duty was to clean the coal of stone, slate, and other impurities, at wages advanced to sixpence per day, and, after promotion, raised to eighteen-pence per day.

After several removals to new openings, as the coal would be worked out in the old, George, who had always lived at home, and was now about fifteen years of age, found himself at the new opening, at Jolly's Close, where he was promoted to the position of fireman, at the opening called "Mid Mill Winnin." There he remained two years, and was then again removed to a new pit near Throckly Bridge, where he worked, and his wages were raised to twelve shillings per week. He next worked at a new opening called Water Row, where a pumping machine was erected, and George, who was then seventeen years of age, was placed in charge as plugman and engineer, while his father worked under

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him as the fireman. At that time he never suffered an opportunity to pass without improving himself in the knowledge of his engine. When not at work, and while others, employed in and about the mines, would be spending their time and earnings in drinking and idle sports, George employed himself in taking to pieces his engine, to possess himself of knowledge and of every peculiarity about it. By these means he became thoroughly acquainted with his engine, and, if at any time it got wrong, he was able to adjust and even repair it, without calling in the aid of the chief engineer of the colliery. At this time (for want of an opportunity), George Stephenson, now entering upon the very threshold of manhood, could not read, nor did he even know his letters. The first rudiments of his education were derived from one Robert Cowen, who had a night-school in the village of Wallbottle; with him he took lessons in spelling and reading, three nights in the week, paying threepence per week for his tuition. Notwithstanding these obstacles in his way, George labored, studied, and persevered, and at eighteen he was able to write his own name.

In 1799 he attended another night school, at Newburn. His teacher was one Andrew Robinson, from whom he learned his arithmetic. During his leisure hours he employed himself in working out the sums set him by Robinson, and in the evening handed in his slate to the master for examination and a fresh supply of sums for his study. George's wages now amounted to £1 15s. 6d. to £2, per fortnight. To this he added his earnings for shoe-mending and shoe-making, which he had taken up.

In 1804 he walked on foot to Scotland, to take charge of one of Bolton & Watt's engines. He re-

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turned, after a year's absence, to Killingworth, on foot, as he had gone, and was soon at work as brakesman at the lifting engine on the West Moore pit.

In 1807 George Stephenson meditated upon emigrating to America; but found himself too poor to pay his passage, and was compelled to abandon the project. To his earnings then he added the repairing of clocks and watches, and the cutting out of clothes for the wives of the workmen to make up. Thus did this energetic and untiring man persevere and labor for advancement in knowledge, until he was promoted as head engineer or plugman, as the engineer was called, at the colliery.

CHAPTER VIII.

STEPHENSON'S ENGINE.

It was now that Mr. Stephenson, about twenty-six years of age, set about the construction of his first locomotive. As we before stated, the want of good and skilful workmen was a great drawback. None of the magnificent and ingenious machinery of the present day to be seen in our machine-shops had been invented. At that early period every part of the engine had to be made by hand, and hammered into shape as a horse-shoe was; and John Thorswall, the colliery blacksmith, was his chief workman; and with all these disadvantages and difficulties to contend with, Mr. Stephenson persevered and finally completed his first locomotive.

It will no doubt be interesting to our mechanical readers to have a full description of Mr. Stephenson's

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first effort. The boiler was cylindrical, eight feet long and thirty-four inches in diameter, with an internal flue-tube twenty inches wide passing through the boiler. The engine had two vertical cylinders of eight inches in diameter and two feet stroke, let into the boiler, working the propelling gear, with cross-heads and connecting rods; the power of the two cylinders was continued by means of spur-wheels, which communicated the motive power to the wheels supporting the engine upon the rails. The adoption of the spur-gear was the chief peculiarity of this new engine; it worked upon what is termed the second motion. The chimney was of wrought-iron, around which was a chamber extending back to the feed-pumps, for the purpose of heating the water previous to its injection into the boiler. The engine had no springs, was mounted on a wooden frame upon four wheels. In order, however, to equalize the jolts and shocks which such an engine would encounter, the water-barrel, which served as a tender, was fixed at the end of a lever and weighted, the other end being connected with the frame of the carriage. The wheels of this locomotive were all smooth, and it was the first engine so constructed. After ten months' labor, this locomotive was completed and put upon the Killingwood Railway on the 25th July, 1814, and tried. On an ascending grade of one in four hundred and fifty feet, this engine succeeded in drawing after it eight loaded wagons of thirty tons' weight, at about four miles an hour, and was the most successful working-engine that had ever been constructed up to this period. It was called "Blucher." Although successful, this improvement over horse-power was not sufficient to justify the abandonment of the latter. The great trouble with this new machine was the inability of keeping

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up steam sufficient to answer its demands; and this experiment, like all its predecessors, might have been set aside as a practical failure, had not Mr. Stephenson hit upon (accidentally) the invention or discovery of the steam-blast. The puffing and noise occasioned by the escapement of the steam from the steam-pipe into the open air, after it had performed its duty in the cylinder, frightened the horses upon the common roads hard by and near the vicinity of the crossings, and occasioned much complaint to the authorities. Mr. Stephenson was warned by the police to abate the nuisance, or be subject to a prosecution. To remedy the evil he hit upon the plan of discharging the surplus steam into the smoke-stack, which produced a vacuum, and the draught in his furnace became so perfect, that double the quantity of steam was generated, and the power of his engine increased to double its former capacity. This was a triumph, and encouraged the inventor to further experiments. Seeing all the defects of his first engine, and the wonderful effects of the steam-blast in facilitating the combustion of the fuel used in generating steam, Mr. Stephenson set about constructing his second engine, the patent dated February 28, 1815.

This second locomotive we will describe, as we think it will prove interesting to our readers, especially so to our engine-drivers or engineers and our locomotive-machinists.

Like the first, this engine had two vertical cylinders, communicating directly with each pair of the fore-wheels which supported the engine, by means of a cross-head and a pair of connecting-rods. It was soon seen that the direct action from the cylinder to the wheels upon such uneven roads would not answer with the rigidity of the machinery, particularly the stiff connecting-rods

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communicating from the wheels to the piston-heads. To obviate this difficulty, Mr. Stephenson invented and applied the ball-and-socket joint upon his connecting-rods, where they were attached to the pistons, and crank-pins upon the crank-axles.

Many other experiments were tried and as quickly abandoned in England by this accomplished engineer, whose name and reputation were as well known in America as they were in England. These experiments tended in a great measure to prevent our own countrymen subsequently from falling into the same errors and mistakes that would be found in the pathway of the early developments of this wonder of science and mechanics, the locomotive.

We will not believe but that a description, step by step—from the first experiments by Trevithick, in 1804, on the Merthyr-Tydvil Railway, in South Wales, when his machine drew after it several wagons containing ten tons of bar-iron at the rate of five miles an hour, to the experiments of Stephenson, with his far-famed Rocket—will prove interesting to the machinists and engineers among our readers, and we will continue our accounts until we come to the date of our own experiments in America.

It will be remembered by our readers that in the Blucher the motion was continued by the spur-wheel system, and its place was supplied by inserting into the axle two cranks at right angles to each other, and this method answered extremely well; but even here Mr. Stephenson found obstacles, in the difficulty, at that early day, of forging cranks of sufficient strength and accuracy to answer the purpose, and stand the jars and jolts occasioned by the rough roads, and he tried a substitute for the requisite object. This new arrangement

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was a chain which rolled over indented wheels on the centre of each axle, and so arranged that the two pair of wheels were effectually coupled and made to keep pace with each other. This did well for a while, but the chains soon proved troublesome, and were abandoned for the new plan of connecting the front and hind wheels together by rods outside of the wheels, instead of rods and cranks inside, as at first. This method completely answered the purpose, and is in use at the present day.

Although many other improvements were afterward suggested to the fertile mind of Mr. Stephenson, and introduced in the machinery of the locomotive Blucher, yet, as a mechanical construction, it may be considered as the type of the present successful locomotive system.

Mr. Stephenson was now left alone in locomotive experiments and improvements: all the other experimentalists before him quitted the field of that kind of enterprise, and all their works in the shape of machines were thrown away and entirely abandoned.

Railways, as we have before stated, had been in successful operation for many years, in the transportation of coal and mineral ores from the mines to the places of shipment. The idea had never been suggested to the mind of any one, or had never, at least, been advocated, to use them for general purposes of traffic, or, as at the present time, for the transportation of goods, wares, merchandise, produce, or for the transportation of passengers from one city to another, until about the year 1800, as we before stated, by a Mr. Thomas, who introduced the subject before the Literary and Philosophical Society of Newcastle, and a few years after by a Mr. Edgeworth, and even then no other power was thought or dreamed of but the horse-power then in use upon all the tram-

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roads (as the railroads were called in all the mining regions throughout England and wherever else they were used), and which had by this time become general, and was looked upon as one of the essential necessaries for such enterprises. But the use of steam-power had not entered the minds of the warmest advocates of railroads for general purposes, as at the present day.

It was not until 1820 that the first suggestion of using the locomotive (imperfect as it then was) in the place of horse-power, was advocated by one Thomas Gray, who devoted much of his time and money in publishing articles and pamphlets upon the subject. He pointed out the importance of such a road between Liverpool and Manchester and other important points, all of which have since been carried out. He was so energetic and pertinacious in his efforts to impress it upon the minds of the people, and so untiring in his labors, that many pronounced him a bore, and those who knew him declared that he was cracked or deranged —just as, nearly two hundred years before, poor Solomon de Cause was shut up in a mad-house for advocating his discovery of a great power in the steam of boiling water.

While Mr. Gray was advocating the adoption of railways for general transportation purposes, George Stephenson was planning locomotives to run upon them.

CHAPTER IX.

FIRST TRAINS.

In 1819 the Hatton Colliery, in Durham, was altered into a locomotive railroad, and Mr. Stephenson ap-

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pointed its chief engineer. He soon began his labors, and on the 18th of November, 1822, the road was opened for the first time for locomotives. Crowds came from all directions to witness the experiment. Five of Mr. Stephenson's engines were upon the road that day, each engine drawing after it seventeen wagons loaded, averaging sixty-four tons, at the rate of four miles an hour.

Mr. Stephenson next became chief engineer of the Stockton and Burlington Railway, another coal-road about being constructed. On account of the nature of the ground over which this road would pass, and the limited means put into Mr. Stephenson's hands for its construction, he was compelled to adopt the incline-plane system in those places where too much labor and money would be required. Other parts of the road were made for horse or steam power, which of the two had not as yet been determined upon. The success of Mr. Stephenson's locomotives had been tried and proved practical, although as yet not a saving in the expense of transportation. But Mr. Stephenson's views prevailed, and when the road was finished, on the 27th of September, 1825, he had three engines ready for its use, They were built at his works, the first ever established for locomotive manufacture. The Active, No. 1, was the first built at this establishment. A great deal of excitement and speculation arose throughout the country when the trial-day approached. The road was ready, as we have stated. Great crowds were assembled from every direction to witness the trial; some, more sanguine, came to witness its success, but far the greater portion came to see the bubble burst. The proceedings began at Brusselton incline, where the stationary engine drew a train up the incline on one side

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and lowered it down on the other. These wagons were loaded.

At the foot of this plane a locomotive, driven by Mr. Stephenson himself, was attached to the train. It consisted of six wagons loaded with coal and flour, next a passenger-coach (the first ever run upon a railroad) filled with the directors and their friends, then twenty-one wagons fitted up with temporary seats for passengers, and lastly came six wagons loaded with coal, making in all twenty-eight vehicles. The word being given that all was ready, the engine began to move, gradually at first, but afterward, in parts of the road, attained a speed of twelve miles an hour. At that time the number of passengers amounted to 450, which would, with the remainder of the load, amount to upward of ninety tons. The train arrived at Darlington, eight and three-quarter miles, in sixty-five minutes. Here it was stopped, and a fresh supply of water was obtained, and the six coal-cars for Darlington detached, and the word given to go ahead. The engine started, and arrived at Stockton, twelve miles, in three hours seven minutes, including stoppages.

By the time the train reached Stockton, the number of passengers amounted to over 600.

We will here mention that, when this road was first contemplated, its projectors did not estimate the amount of coal that would be transported over it above 10,000 tons per annum; but before a very few years had elapsed, from the facilities offered by the railroad system, with locomotives instead of horse-power, the amount of coal transported annually amounted to 500,000 tons, and has since exceeded that amount. At this trial experiment, September 27, 1825, the first passenger-car, or wagon as it was called at that day, was put upon the road. It

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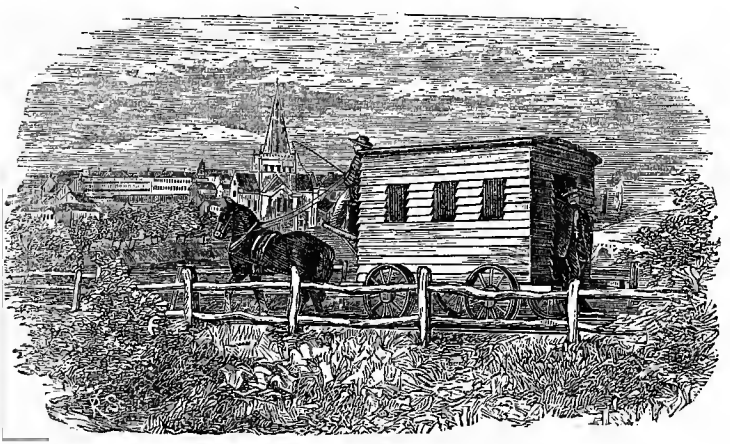
had been ordered and made at Mr. Stephenson's works, and had only arrived the day before the trial. It was the vehicle in which the directors and their friends rode upon the occasion. Although built by Mr. Stephenson, it was a very modest and uncouth-looking affair, made more for strength than for beauty. A row of seats ran along each side of the interior, and a long table was fixed in the centre, the access being by a doorway behind, like an omnibus of the present day. This vehicle was named the Experiment, and was the only carriage for passengers upon the road for some time. It was, however, the forerunner of a mighty traffic, and soon after new and more improved passenger-carriages were introduced upon the road, all at first drawn by horses.

FIG. 3.



THE FIRST RAILWAY COACH.

The Experiment was first regularly put upon the road for passenger use on the 10th of October, 1825. It was drawn by one horse, and performed a journey each way daily between the two towns, twelve miles, in two hours. This novel way of travelling soon became popu-

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lar among the people, and eventually proved so lucrative and extensive, that the carriage could not contain the number of applicants for a ride. Inside and outside it was crowded, and every available spot was occupied. The Experiment, however, was not worked by the railroad company as passenger-cars are now, but was let to other parties, they paying a certain toll for the use of the road. It soon became a lucrative business, and hotel-keepers and others embarked in the enterprise, and a strong opposition was raised up between the rival owners or companies. The old carriage, the Experiment, was found too heavy for one horse; a new one was placed in its stead, and the old pioneer was afterward used as a railroad cabin near Shildon. To the driver of the old Experiment the first introduction of lights being used in passenger-cars, for the comfort of passengers, is due. This honest and considerate driver, whose name was Dixon, nightly purchased a penny candle, and when he was belated and it became dark in the carriage, he would light his candle and stick it upon the table running along the centre of the carriage, between the two rows of seats, which added much to the comfort of his patrons.

At that time the transportation of freight, like that of passengers, was not confined to the company alone. According to their charters, railroads were public highways. Any individual or company had the right of using the road with their own private wagons on paying a certain stipulated toll affixed by law. Like the passenger-carriages, private individuals owned freight-wagons for the transportation of produce or their own manufactures to market, and used the road for the purpose. This traffic, like the passenger transportation, soon led to confusion and delays. Being a single-track

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road, with only occasional sidings or turnouts here and there upon its route, the carriages often met upon the way, going in opposite directions. Then would begin a violent contest between the rival drivers, not only in words, but sometimes resulting in blows, to determine who should back to the siding and turn off to allow the other to pass. In these contests not unfrequently the passengers would take sides with their respective drivers, and scenes of riot and pugilistic displays were often the result of these contests, until one party or the other would be compelled to succumb. After a while this difficulty was somewhat diminished by the opposition parties coming to a kind of understanding that, in meeting upon the track, the carriage containing the lightest load should back off to the nearest siding; and finally it became a fixed rule that, whichever carriage arrived last at the half-way post, planted between the two sidings, should back off to allow the other to pass. This plan, though it tended in a great measure to render less frequent these difficulties and contests, subjected the working of the road to much trouble and delay, so that these private enterprises were superseded by the company commencing the regular passenger transportation system, which by that time became a source of much importance in the traffic upon the road, and must be considered as the first introduction of this source of profit upon all railroads of our time, exceeding, in many cases, the income from the freight department.

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CHAPTER X.

FIRST DELIBERATIONS ON RAILROADS.

When the construction of that great work, the Liverpool and Manchester Railroad, was commenced, and even after it had been in progress for several years, its directors had not determined the motive power to be employed upon it. Horse-power had the strongest advocates. Another method, and one having a number of advocates, was that of stationary engines to draw the trains along. By this method the line of road over which the transport is conducted is divided into a number of short sections, at the extremity of each of which an engine is placed. The wagons or carriages, when drawn by any one of these engines to its own station, are detached and connected with the extremity of the chain worked by the next stationary engine, and thus the journey is performed from station to station by separate engines. It was proposed to divide the Liverpool and Manchester road into nineteen stations, or sections of about a mile and a half each, with twenty-one engines fixed at the different points to work the chains forward. Not a single professional man of any eminence could be found who preferred the locomotive over the fixed-engine power as above, George Stephenson only excepted. He stuck to the locomotive-power; and finally committees were appointed at his suggestion to witness the performance of his locomotives employed in hauling coal upon the Stockton and Darlington Railroad. The report from the chairman of one of these committees states that, "although it would be practicable to go at any speed that the size of the wheel and the

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number of strokes in the engine might allow, yet it would not be safe to go at a greater rate than nine or ten miles an hour." This was considered a very high rate of speed in those days. The completion of the road was fast drawing nigh. The great tunnel at Liverpool was finished; a firm road over Cheat-Moss was completed; and yet the directors had not settled in their minds what power was to be used upon the road. Prejudice still existed against the use of locomotives. The road had been constructed throughout its entire length in a most substantial manner, and cost upward of £20,000 per mile, amounting to £820,000. The rails used were made of forged iron, in lengths of fifteen feet each, and weighed 175 lbs. each. At the distance of every three feet the rail rests on blocks of stone, let into the ground and containing about four cubic feet each. Into each block, two holes, six inches deep and one inch in diameter, are drilled; into these are driven oak plugs, and the cast-iron chairs into which the rails are fitted are spiked down to the plugs, forming a structure of great solidity, and in every respect calculated for any power that might be determined upon by the Board.

Finally, in the spring of 1829, the directors appointed Messrs. Stephenson and Lock, and Messrs. Walker and Rastrick, experienced engineers, to visit the different railways where practical information respecting the comparative effects of stationary and locomotive engines could be obtained; and from these gentlemen they received reports on the relative merits of the two methods, according to their judgment. The result of the comparison of the two systems was, that the capital necessary to be advanced to establish a line of stationary engines was considered greater than that which was necessary to construct an equal power in

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locomotives; that the annual expense for maintaining the stationary engines was likewise greater than for the locomotives, and consequently the expense of transportation by a stationary system was greater in like proportion. The system of locomotive-power, therefore, was entitled to the preference. Yet another consideration influenced the directors in its favor, which was this: Should an accident occur on any part of the railroad worked by stationary engines, a suspension of work along the entire road would be involved in the consequences; accidents arising from the fracture of any of the chairs, or from any derangement in the working of any of the fixed engines, would effectually stop the intercourse along the entire line; while in the use of locomotive-power an accident could only affect the particular train of carriages drawn by the engine to which the mishap might occur. "The one system," says Mr. Walker, in his report, "is like a chain extending from Liverpool to Manchester, the failure of a single link of which would destroy the whole; while the other (the locomotive system) is like a number of short and unconnected chains, the destruction of any one of which does not interfere with the effect of the others, and the loss of which may be supplied by others with facility." However, to determine the matter, a prize was offered by the directors of £500 for a locomotive which should be produced by a certain day, and perform a certain duty, as follows:

1. The engine must effectually consume its own smoke.

2. The engine, if of six tons' weight, must be able to draw after it, day by day, twenty tons' weight, including the tender and water-tank, at ten miles an hour, with a pressure of steam upon the boiler not exceeding fifty pounds to the square inch.

3. The boiler must have two safty-valves, neither of which

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must be fastened down and one of them completely out of the control of the engineer.

4. The engine and boiler must be supported upon springs and rest on six wheels, the height of the whole not exceeding fifteen feet to the top of the chimney.

5. The engine with water must not weigh more than six tons, but an engine of less weight would be preferred, although drawing a proportionally less load behind it; if of only four and one-half tons, it might be put on four wheels.

6. A mercurial gauge must be affixed to the machine, showing the steam-pressure about forty-five pounds to the square inch.

7 The engine must be delivered, complete and ready for trial, at the Liverpool end of the railway, not later than October 1, 1829.

8. The price of the engine not to exceed £550.

The project and the conditions were thought to be preposterous. An eminent gentleman of Liverpool, afterward inspector of steam-packets, said that "only a parcel of charlatans would have issued such a set of conditions;" that it had been "proved to be impossible to make a locomotive-engine to go ten miles an hour; but, if it was ever done, he would undertake to eat a stewed engine-wheel for his breakfast!"

The Stephenson locomotive factory was still in operation at Newcastle, but for a long time it did not pay expenses. Mr. Stephenson now set about the construction of his far-famed engine the Rocket, to contend for the prize just offered by the Liverpool and Manchester railroad directors. As the name of Mr. Stephenson's Rocket is familiar in the mind of every railroad engineer and machinist of the present day, we will describe it, for the information of all who feel interested in the subject: The boiler of this new engine was cylindrical in form, with flat ends; it was six feet in length and three feet in diameter, the upper half of the boiler used as a reservoir for the steam, the lower half

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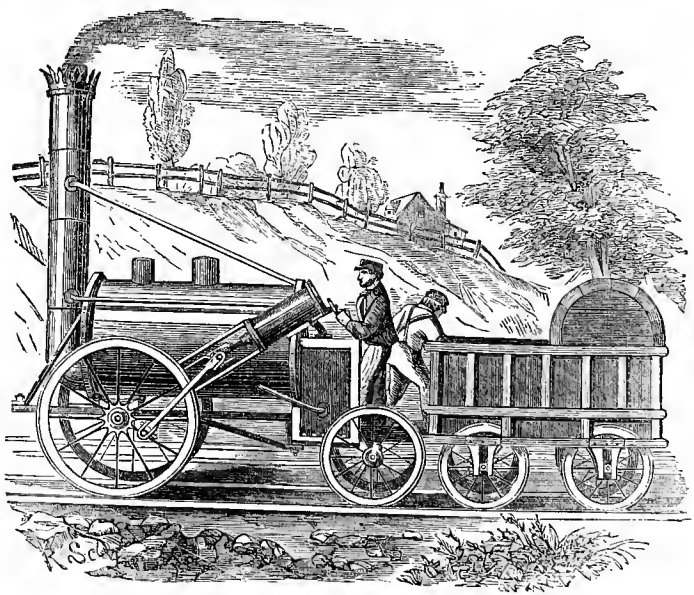
being filled with water; through this lower part twenty-five copper tubes three inches in diameter extended with both ends open, one presented to the furnace or fire-box, and the other end opening into the chimney. The fire-box, two feet wide and three feet high, attached immediately behind the boiler, was also surrounded with water. The cylinders, two in number, were placed on each side of the boiler in an oblique position, the one end being nearly even with the top of the boiler, and the other end pointing toward the centre of the foremost driving pair of wheels, with which the connection was made from the piston-rod by a pin to the outside of the wheel.

Fig. 4.



THE ROCKET LOCOMOTIVE.

The Rocket with its load of water weighed only four and one-quarter tons, and was supported upon four

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wheels (not coupled). The tender was four-wheeled, and similar in shape to a wagon; the foremost part contained the fuel, and the hinder part a water-cask.

The engine, when completed, was shipped to Liverpool and ready for the trial, with the most sanguine expectations of Mr. Stephenson of its success.

CHAPTER XI.

COMPETITION FOR PRIZES.

A GREAT interest was manifested at Liverpool and throughout the country at the approaching competition. Engineers and scientific men arrived from all quarters of the world, to witness the trial of mechanical skill about to be displayed.

On the day appointed the following engines were upon the spot, and entered for the prize:

THE NOVELTY, made by Messrs. Braithwait and Ericsson.
THE SANS-PAREIL, made by Mr. Timothy Hockworth.
THE ROCKET, made by Messrs. Stephenson and Co., Newcastle.
THE PERSEVERANCE, made by Mr. Burtstall.

The day of trial was changed from the 1st to the 6th of October, in order to give the new engines time to get in good working-order. Many thousand spectators were present. The Rocket, although not the first entered, was, nevertheless, the first ready for the trial. The piece of road to be used for the occasion was two miles in length, upon which the locomotives were to travel to and fro. The distance run by the Rocket was about twelve miles in fifty-three minutes. The

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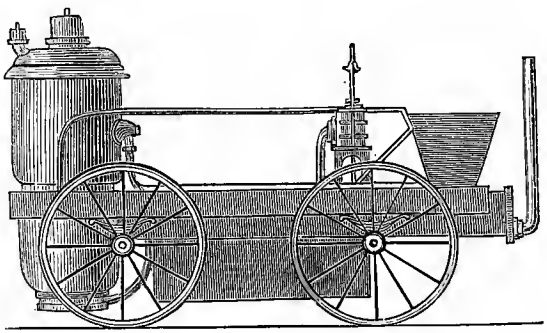
Novelty was next tried. It was a very complicated machine, carrying the water and fuel upon the same wheels as the engine, and the whole weighed three tons one hundred lbs. On account of some difficulty in determining the load she was to draw, she was not tested like the Rocket, but was run over the road, making sometimes twenty-four miles per hour.

Fig. 5.



THE NOVELTY LOCOMOTIVE.

The Sans-pareil was next tried, but no particular experiment was made on that day.

The contest was postponed until the following day, but, before the judges arrived upon the ground, the bellows for creating the draught or blast in the Novelty gave way, and it was incapable of going through its performance. A defect was also discovered in the boiler of the Sans-pareil, and time was allowed to get it repaired. Meantime, Mr. Stephenson, to lessen the disappointment to the vast crowd assembled to witness these experiments by the delay, brought out the Rocket and attached it to a coach containing thirty persons, and ran it along the road at the rate of from twenty-six

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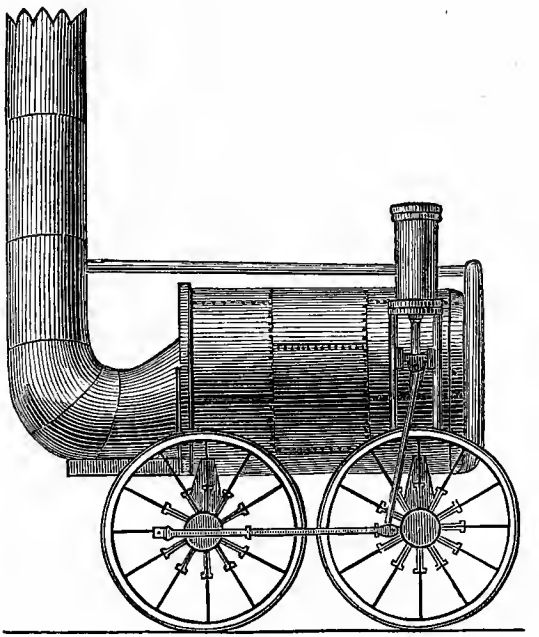
to thirty miles an hour, much to the delight and gratification of the spectators. The judges then ordered the Rocket to be in readiness the following morning to go through its trial according to the prescribed conditions.

Fig. 6.



THE SANS-PAREIL LOCOMOTIVE.

On the morning of October 8, 1829, the Rocket was again upon the road for the contest. The fire-box was filled with coke, the fire lighted, and the steam raised until it lifted the safety-valve loaded to the pressure of fifty pounds to the square inch. These preparations occupied fifty-seven minutes. The engine being started on its journey, dragged after it thirteen tons' weight

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in carriages or wagons, and made the first ten trips backward and forward upon the two miles of the road, running the thirty-five miles, including stoppages, in one hour and forty-eight minutes.

The second ten trips were in like manner accomplished in two hours and three minutes. The maximum velocity of the Rocket during the trial-trip was about twenty-nine miles an hour, or three times the speed that one of the judges had declared to be the limit of possibility.

Neither the Novelty nor the Sans-pareil was ready for trial until the 10th. The weight of carriages attached to the Novelty was only seven tons. In starting, the engine went off in fine style for the two miles, but, on returning, the pipe for the forcing-pump burst and put an end to the trial. The pipe having been repaired, the engine made a trial-trip, without a load, and is said to have run from twenty-four to twenty-eight miles an hour.

The Sans-pareil was not ready until the 13th, and, when the boiler and tender were filled with water, it weighed 400 lbs. beyond the prescribed conditions of four-wheel engines; but nevertheless the judges allowed it to run upon the same footing as the others, and it travelled at the average speed of fourteen miles an hour, with its load; but at the eighth trip the cold-water pipe got out of order, and it could proceed no farther. It was then determined by the judges to award the prize to the successful engine on the following day, October 14th.

When the trial commenced, the Novelty again broke down. The builder of the Sans-pareil requested an other trial, but the judges decided that she was beyond the prescribed weight, and besides consumed and

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wasted too much coke to make her a successful competitor, using 692 lbs. of coke per hour when running.

The Perseverance was then tried for the first time, and found unable to move more than five or six miles an hour.

The Rocket was the only engine that had performed all the stipulated conditions, and the prize of £500 was accordingly awarded to its makers. The Rocket had eclipsed all other engines that had as yet been constructed, and determined the question of the use of locomotive power upon the Liverpool and Manchester Railroad.

Our narrative now brings us down to the period when locomotives were first introduced into the United States, A. D. 1829. Two important railroads had been commenced, and were in successful working-order, as far as they had been built. But horse-power upon levels, and stationary engines upon steep inclines, were the only powers resorted to. Locomotives had not yet been introduced. The experiments in England had been heard of in this country, and were frequently discussed by those interested in the success of railroads. The experiments of Mr. Stephenson had been carefully watched. His name and fame, as an eminent engineer, were familiar to the minds of the people of this country. His success with his "Rocket" excited the liveliest interest here, and equally as much so as in England. His bearing off the £500 prize was hailed with rapture by thousands in America, who admired him for his genius and indomitable perseverance.

We will now leave Mr. Stephenson and his improvements in England, and turn to the period of 1829, in the United States, when, although, as before said, two important railroads and two coal-roads were in success-

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ful progress, or in operation in different sections of the country, yet, as in England in its earliest day, for mining purposes, only horse-power was used, and no attempt had been made to construct a locomotive, nor had one been imported from abroad.

CHAPTER XII.

RAILROADS IN AMERICA.

The first railroad built in the United States was three miles in length, extending from the granite-quarries of Quincy, Massachusetts, to the Neponset River. This road was commenced in 1826, and completed in 1827. It was built with granite sleepers, seven and a half feet long, laid eight feet apart. The rails, five feet apart, were of pine, a foot deep, covered with an oak plate, and these with flat bars of iron.

The second railroad was commenced in January, 1827, and completed in May of the same year, extending from the coal-mines in Mauch Chunk, Pennsylvania, to the Lehigh River, a distance of nine miles. From the summit of the road, and within half a mile of the mines, the descent by a plane was nine hundred and eighty-two feet, inclined two hundred and twenty-five feet to the river, and thence twenty-five feet in a shute to the spot where the cars were discharged into the boats. The cars descended by gravity with the loaded wagons, and were drawn up again by mules. The rails of the road were of timber, laid on wooden sleepers, and strapped with flat iron bars.

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In 1828 the Delaware and Hudson Canal Company constructed a railroad from their coal-mines to Honesdale, the termination of their canal. The Baltimore and Ohio Railroad and the South Carolina Railroad were also commenced in the same year.

It is said that at the time (1812) when De Witt Clinton was urging the passage, through the Legislature of New York, of the act for the construction of the Erie Canal, Colonel Stevens, of Hoboken, astonished that body by announcing that he could build a railroad at a much less cost than the proposed canal, and on which the transportation, by means of cars drawn by steam locomotives, could be carried on at a considerably cheaper rate, and at a much higher degree of speed than was possible on any canal. He laid before them the results of his numerous and long-continued researches, but his enemies openly laughed at him, and called him a maniac, and even some of his best friends regarded him as a man who had lost himself in experimental science. Had he lived in the days of poor Solomon de Cause or of Friar Bacon, he would probably, like those eminent men, have been consigned to a dungeon. The nineteenth century contented itself with sneering at him as a visionary, and refused to entertain his propositions. His distinguished, wise, and sensible friend, Chancellor Livingston, in a letter addressed to Stevens, dated at Albany, March 2d, 1811, only a year before, expresses his opinion of the railroad locomotive schemes of which his friend was so strenuous an advocate. The chancellor thus writes:

"I had before read of your very ingenious proposition as to railway communication. I fear, however, on mature reflection, that they will be liable to serious objections, and ultimately prove more expensive than a canal. They must be double, so as to

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prevent the danger of two such heavy bodies meeting. The wall on which they are placed must be at least four feet below the surface, to avoid frost, and three feet above, to avoid snow, and must be clasped with iron, and even then would hardly sustain so heavy a weight as you propose moving at the rate of four miles an hour on wheels. As to wood, it would not last a week. They must be covered with iron, and that, too, very thick and strong. The means of stopping these heavy carriages without a great shock, and of preventing them from running on each other—for there would be many running on the road at once—would be very difficult. In case of accidental stops or necessary stays to take wood or water, etc., many accidents would happen. The carriage of condensing water would be very troublesome. Upon the whole, I fear the expense would be much greater than that of canals, without being so convenient."

And yet, only fourteen years afterward, such was the rapid development of the steam locomotive, the Legislature of the same State granted a charter incorporating the Mohawk and Hudson Railroad, a line, seventeen miles long, running between Albany and Schenectady; and there are now no less than three thousand one hundred and ninety-five miles of railway in the State of New York alone.

Next to Colonel Stevens, and as early as 1819, we have in the United States another advocate for railroads, with steam locomotion. We learn, by an extract from the current news of that day, copied from a literary paper called *The Villager*, that the following memorial was presented to Congress at the previous session, which was referred to the Committee on Commerce and Manufactures. The following is a copy of the document:

"The memorial of Benjamin Dearborn, of Boston, respectfully represents that he has devised in theory a mode of propelling wheel-carriages in a manner probably unknown in any country; and has perfectly satisfied his own mind of the practicability of

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conveying mails and passengers with such celerity as has never before been accomplished, and with complete security from robberies on the highway.

"For obtaining these results, he relies on carriages propelled by steam, on level railroads, and contemplates that they be furnished with accommodations for passengers to take their meals and their rest during the passage, as in packets; that they be sufficiently high for persons to walk in without stooping, and so capacious as to accommodate twenty, thirty, or more passengers, with their baggage.

"The inequalities of the earth's surface will require levels of various elevations in the railroads; and your memorialist has devised means which he believes will be completely effectual for lifting the carriage, by the inherent power of its machinery, from one level to another, as also for the passage of carriages by each other, on the same road; and he feels confident that whenever such an establishment shall be advanced to its most improved state, the carriages will move with a rapidity at least equal to a mile in three minutes.

"Protection from the attacks of assailants will be insured; not only by the celerity of the movement, but by weapons of defence belonging to the carriage, and always kept ready in it to be wielded by the number of passengers constantly travelling in this spacious vehicle, where they would have liberty to stand erect, and to exercise their arms in their own defence.

"The practicability of running steam-carriages on the common road was long since advocated in a publication, by that ingenious and useful citizen, Oliver Evans: your memorialist, therefore, does not assume the merit of originating the idea of steam-carriages, but only of modifying the system in such a manner as to produce the results here stated, which could not be effected on a common road.

"Relying upon the candor of the national council, this memorial is laid before them with the desire that ingenious and scientific artists, in the different sections of our country may be consulted, by direction of Congress, on the probability of accomplishing the purposes here anticipated; and that an experiment be made, if sanctioned by their favorable opinions; for if the design can be put into successful operation by the Government, a great revenue would eventually be derived from the establishment, besides the advantages before enumerated."

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We never have heard that any report was made by the committee respecting it; yet all these results have been signally realized within a little more than a third of a century.

CHAPTER XIII.

FIRST ENGLISH LOCOMOTIVE.

The competition in England for the £500 prize attracted many distinguished engineers, scientific men, and enterprising gentlemen, from all parts of the world, to witness the contest. Among the engineers from America was Horatio Allen, Esq., late assistant engineer upon the Delaware and Hudson Canal and Railroad, who was on a trip to England to examine into the improvements in the new mode of intercommunication. Another enterprising gentleman from America, who went out expressly to witness these experiments, was Mr. E. L. Miller, of Charleston, South Carolina. Of this gentleman we shall hereafter have occasion to speak more fully. While in Europe, Mr. Horatio Allen was appointed by John B. Jervis, Esq., the chief engineer of the Delaware and Hudson Canal and Railroad Company, to contract for the iron for the road just graded, and also for three locomotives. Mr. Allen was an excellent person for this important duty, as Mr. Jervis well knew, having been associated with him in the construction of the road; he was an engineer of distinction and experience. We shall have to speak of him hereafter, in connection with the running of the

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first locomotive imported and put upon a railroad in America.

In this work the author has promised to substantiate every position he may assume, by giving to the readers all the evidence upon which his statements are based, and thereby enable them to judge for themselves as to the correctness of his history.

On this visit of Mr. Allen to England, he purchased for the Delaware and Hudson Canal and Railroad Company three locomotives. The "Stourbridge Lion" was one of these, and the first, which soon after arrived in New York. Its performances in the yard of the works where it was landed (the West Point Foundery Works, foot of Beach Street) were witnessed by thousands, attracted by the novelty of the machine. In a letter addressed to the author by David Matthew, Esq., late of Philadelphia, who resided in New York in 1829, and had charge of the men while fitting up the machinery in the shops of the West Point Foundery Association, to whom the author had addressed a letter making some inquiries, he writes:

"PHILADELPHIA, *December* 6, 1859.

"MR. WM. H. BROWN—

"DEAR SIR: Yours of the 20th November is received, inquiring about the first locomotive imported into this country; the first built here, and on what date and railroad it was run. In compliance with your request, I herewith with pleasure send you the following history, partly from memory and partly from records and memoranda upon the subject in some documents I have preserved among a file of old papers and documents.

"Some time about the middle of May, 1829, the locomotive called the Stourbridge Lion arrived from England, on the ship John Jay. It was landed at the wharf of the West Point Foundery Works, foot of Beach Street, New-York City. This engine was in charge of Horatio Allen, Esq., assistant engineer of the Delaware and Hudson Canal and Railroad Company. The

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locomotive was blocked up in our yard, and steam put to it from our works, and it became the object of curiosity to thousands who visited the works from day to day, to see the curious "*critter*" go through the motions only, as there was no road for it about the premises. After a short stay in New York, about the 1st of July, it was shipped up the North River to Rondout, for the Delaware and Hudson Canal Company, and thence by canal to Carbondale, where it was tried upon their railroad at Honesdale, run a few miles out upon the road, then taken off the track, the road not being sufficiently strong to carry it. It was housed and held for sale for many years."

So much, at present, for Mr. Matthew's letter upon the first English locomotive in America. To this letter, however, we will hereafter again refer. Meantime, for the information of such of our readers as may not be acquainted with the character and reputation of Mr. Matthew, we will refer to the following certificates from prominent and well-known citizens:

"NEW YORK, *March*, 1831.

"Mr. David Matthew has served an apprenticeship of four years and eleven months in the steam-engine factory of the West Point Association, as a tinner and fitter-up, in course of which time he has conducted himself to the entire satisfaction of his employers, and I recommend him as a trusty and good workman.

"WM. KEMBLE,
"*Agent for the West Point Association.*"

"ALBANY, *December* 1, 1831.

"The bearer, Mr. David Matthew, has been employed to run the locomotive De Witt Clinton on the Mohawk and Hudson Railroad, since the opening of the work. I have often been on the engine with him, and seen much of his management and conduct in reference to his business, and believe him to be a sober, industrious man, and well qualified for such work. I think him very prudent in managing an engine.

"JOHN B. JERVIS,
"*Chief Engineer Hudson and Mohawk Railroad.*"

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"SCHENECTADY, *September* 24, 1835.

"By a resolution of the Board of Directors of the Utica and Schenectady Railroad Company, passed September 23, 1835, David Matthew is employed as chief locomotive engineer, at a salary of one thousand one hundred dollars per year.

"WM. C. YOUNG,
"*Chief Engineer.*"

"OFFICE OF THE UTICA AND SCHENECTADY RAILROAD COMPANY.
"ALBANY, *August* 29, 1842.

"*To whom it may concern:*

"The bearer, Mr. David Matthew, has been employed by the company during the past six and a half years, as chief locomotive engineer and machinist, and in all respects has shown himself honest, industrious, and intelligent, and is worthy of patronage and confidence.

"ERASTUS CORNING."

These and many other evidences of Mr. Matthew's character and reliability could be produced, but the foregoing will no doubt be sufficient.

From a mass of useful information received by the author in several letters from John B. Jervis, Esq., who was in 1829 chief engineer of the Delaware and Hudson Canal Company, we make the following extracts in reference to the arrival of the first locomotive in America:

"ROME, NEW YORK, *July* 17, 1870.

"DEAR SIR: Yours of the 1st inst. was duly received; absence from home and special duties have delayed my answer. As it required the overhauling of papers forty years old, it could not be done promptly. The name of the first locomotive ordered from England, and the first in America, was the Stourbridge Lion, and to your questions when and where it was landed, I will refer you to the following letters addressed to me at the time, by Horatio Allen, Esq., who was in New-York City waiting its arrival, and had contracted for it when in England. On referring to my papers, I find that the engine arrived at Rondout on the way to Honesdale from New York, on the 4th of July, 1829. My recol-

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lections are that it was put in motion on the Carbondale Railroad, at Honesdale, in August, same year, most probably the early part of August. This locomotive and two or three others were obtained from England for the said road, but only the Lion was set up. It worked very well, and no doubt would have done good service, had the trestle-work (of which there was a large portion on the road) been sufficient to sustain the weight of the engine in working. It was the intention of having engines of one and a quarter ton on a wheel as the heaviest; but the builders of the engine at that time had little experience, and when the machine was constructed it was found to have nearly two tons on a wheel, and this the road was not designed for. Subsequently the road has been made a gravity railroad, all the power in both directions being stationary; which is no doubt the best economy for the circumstances and nature of the traffic.

"Mr. Allen's letters, which follow, will give you all necessary facts relative to the arrival of the first locomotive in America. In regard to the present officers of the Delaware and Hudson Canal Company, I have little acquaintance with them; all the old ones are gone, excepting, perhaps, Isaac N. Seymour, who was for many years treasurer (now retired), and living in New York. He could give you much information, by referring to the file of letters for 1829, in the office of the company in New York, including those of August; they would give the time of the running of the engine at Honesdale, in letters from Mr. Horatio Allen to myself. In your last letter to me, you make some inquiries concerning my invention of the principle of using the truck under the front part of the engine, to support and to govern the machine in running curves. I believe I sent you, some time since, a copy of my work upon railway property, etc. In that work, commencing at page 153, you will find all the information upon that subject you may desire. I shall only say here that I was the inventor, and put in successful operation, the locomotive-truck.

"I notice that they are giving more attention to it in England, where they heretofore had strong prejudices against it, and now they attribute it, as a new thing, to Farlie, who introduced it in some new and small machinery in England. All that Farlie has done is simply to adopt my truck. Wishing you great success in your undertaking, I am very truly yours,

"JOHN B. JERVIS."

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We will hereafter notice the improvement alluded to by Mr. Jervis, in the last paragraph of his highly-interesting letter, viz., the introduction of the truck under the front part of the engine. Of this improvement he is, no doubt, the inventor, having put it in successful operation in this country, nearly forty years ago, as we are prepared to show, England's claim to the contrary notwithstanding.

"New York, *May* 12, 1829.

"John B. Jervis, Esq.:

. . . . "We at length have something definite on the subject of our locomotive. The Canada, that sailed from Liverpool April 15th, arrived this afternoon, and brings us news of the shipment of our locomotive, on April 8th, on the John Jay, which has not yet got in, though it sailed one week before the Canada.

"Yours,

"Horatio Allen."

"New York, *May* 17, 1829.

"John B. Jervis, Esq.:

. . . . "The John Jay has arrived, as I informed you. On Monday the engine is to be landed, and sent to Kimball's establishment. I hope to have it all together and in operation by Saturday next. Yours,

"Horatio Allen."

CHAPTER XIV.

DATE OF ITS RUNNING.

The exact date of the arrival and landing of the first English locomotive that was ever run upon a railroad in America being now settled by Mr. Horatio Allen's letters to John B. Jervis, Esq., the next object of the author was to learn upon what day that engine was first run upon a railroad. For this purpose, by advice

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of Mr. Jervis, he addressed a letter to C. F. Young, Esq., the present general superintendent of the Delaware and Hudson Railroad and Canal Company. Previously to receiving Mr. Young's answer, the author addressed a letter to Thomas Dickson, Esq., the president of the company, to which he received the following reply.

"DELAWARE AND HUDSON CANAL COMPANY,
"SCRANTON, *February* 26, 1870.

"WM. H. BROWN, ESQ.,—

"DEAR SIR: I have yours of the 19th inst. C. F. Young, of Honesdale, Pennsylvania, our general superintendent, has been looking up, for you, the matters you refer to, and has doubtless written you ere this. In a conversation I had with Mr. Young, a few days ago, he told me that the time of the trial-trip he had found *positively* to have been between the 3d and 8th of August, 1829. That it was in 1829, and on one of *the days mentioned*, there is not the shadow of a doubt, and that it was the first locomotive run upon this continent is beyond question.

"We take pleasure in affording you every opportunity in making your investigation; and, that there may be no mistake, I will enclose your letter to Mr. Young, that his attention may be called to it again.

"Very truly yours,
"THOMAS DICKSON, *President.*"

Almost the same mail brought the long-looked-for letter from Mr. Young; and, as he gives the date of the first day's trial near to the consummation of the author's desire upon that subject, we will, as we promised our readers, present Mr. Young's letter, just as it was written, as every portion of it is of interest:

"OFFICE OF GENERAL SUPERINTENDENT,
"DELAWARE AND HUDSON CANAL COMPANY,
"HONESDALE, PA., *February* 23, 1870.

"WM. H. BROWN, ESQ.,—

"DEAR SIR: I owe you an apology for the long delay in furnishing you what information I might be able to obtain respecting

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the date of the experimental trip of the first locomotive-engine imported by our company. I waited to hear from a gentleman who was to have examined a file of newspapers, published at Montrose, Susquehanna County, in 1829; but I have not yet heard from him. I have not been able, from any thing I can find in the books or papers of the company, to fix the exact day on which the trial-trip took place. I find from our collector's books, at Eddyville, that two locomotive-engines were cleared at that office, and started up the canal, July 16, 1829. I do not find any record of their arrival at Honesdale, which was probably five or six days thereafter.

"The old inhabitants of this place, who were present at the time, agree that the experimental trip was made in August, 1829. Hon. John Torry informs me that he finds in the books of his father, Jason Torry, a charge against the Delaware and Hudson Canal Company, dated August 3, 1829, for labor of men and horses, drawing stones, 'this day,' to load a railroad-car. This car, loaded with stone, is understood and believed to be the one which was to be attached to the locomotive on its trial-trip. I find many, who were present at the time, remember the car-load of stone designed to be attached to the locomotive on its trial-trip. At the celebration, on the day the experiment was made, a young man, by the name of Alva Adams, had his arm badly shattered by the premature discharge of the cannon which was used. Dr. E. T. Losey, who is now living here, assisted in amputating the arm and afterward attended the patient. Dr. Losey finds the charge on his books, for amputating, dated August 8, 1829. The trial-trip, no doubt, took place some time from the 3d to the 8th of August, 1829. Dr. Losey thinks the arm was amputated the same day on which the injury was received; but says he might have omitted to make the charge for three or four days, but is not certain of this.

"I have had the file of letters for 1829 examined, at our office in New York, without finding any letters from John B. Jervis or Horatio Allen which fix the date of the experiment. I am of opinion that there were such letters, and that they have been lent to some previous explorer, who has failed to return them.

"John B. Jervis's annual report for 1829 I have examined (it is now in our New-York office); but, while he speaks of the causes of failure as to the success of the locomotive, he does not give the day on which the experiment was made.

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"I am sorry that I am unable to fix the exact day on which the trial-trip of the first locomotive was made, but there is no doubt it occurred some time from the 3d to the 8th of August, 1829. "Yours very truly,

"C. F. YOUNG,

"*General Superintendent.*"

Determined to leave no stone unturned and no effort untried to establish the exact day the first locomotive was run upon a railroad in America, the author (taking the hint from Mr. Young's letter) addressed the postmaster of Montrose, relative to the old file of newspapers said to be in existence, stating the object of his inquiry. In a few days he received a reply from a lady, Miss Emily C. Blackman, offering her aid and services in examining the said file, and through her energy and perseverance he received much valuable information, by following which, he was rewarded with complete success. In one of Miss Blackman's letters, she corroborates Mr. Young's information, by the following extract from the Montrose paper:

"*Melancholy Accident.*—We are informed that a young man, by the name of Adams, was severely injured on Saturday last, at Honesdale, by the sudden and unexpected discharge of a cannon. Adams and others were engaged in firing signals on starting the locomotive-engine."—*From the Dundaff Republican, but no date.*

Through the kindness of Miss Blackman, the author learned that a file of the *Dundaff Republican* of 1829 could be obtained from Dilton Yarrington, Esq., of Carbondale; who, on application, kindly forwarded the same to the author. From this file, under date of Thursday, August 13, 1829, we extract the following:

"*Melancholy Accident.*—We are informed that a young man, by the name of Adams, was severely injured on Saturday last, at Honesdale," etc., etc.

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"Saturday last," before Thursday, 13th, was the 8th day of August, 1829, and, without a shadow of doubt, the day the first locomotive turned a driving-wheel upon a road on the American Continent.

CHAPTER XV.

LANDING IN AMERICA.

THE author was next at a loss how to account for the long interval, some six weeks or more, which elapsed after the Stourbridge Lion arrived in New York, by Mr. Allen's letter, before its first appearance upon the railroad at Honesdale; when the prompt and indefatigable lady correspondent, Miss Blackman, again came to his relief with a statement abstracted from her own private journal, which was as follows:

From Morning Courier and New York Enquirer, June 12, 1829.

"*Locomotive-Engines.*—We yesterday attended the first exhibition of a locomotive-engine, called *The Lion*, imported by the Delaware and Hudson Canal Company, to be used upon their railway. On Wednesday, the engine, just imported, was tried, and gave such general satisfaction, that the present exhibition was unanimously attended by gentlemen of science and particular intelligence. The engine was put up in Mr. Kimball's manufactory, by Horatio Allen, Esq., who went to England to purchase it for the company, and it gives us great satisfaction to say that the most important improvements which have lately been made in the construction of these engines originated with him. It is of nine-horse power, having a boiler sixteen and a half feet long, with two cylinders, each of three-feet stroke. It is calculated to propel from sixty to eighty tons, at five miles per hour. The power is applied to each wheel at about twelve inches from the centre, and

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the adhesive power of the wheel, arising from the weight of the engine, will give locomotion to the whole structure.

"The steam was raised by the *Lackawaxen* coal, and sustained (although there was no friction) at between forty and fifty pounds to the inch.

"We were delighted with the performance of the engine, and have no doubt but the enterprising company to whom it belongs will reap a rich reward for their enterprise and perseverance.

"Pleased as we were, however, with the engine, we were much more pleased with the practical demonstration offered, of the importance and usefulness of the coal which the company propose to bring to market. It is now reduced to a certainty that the Lackawaxen coal will generate steam in sufficient quantity to answer all the purposes to which it is applied, and this fact is not only of great importance to the company, but is worth millions to our State."

To the kindness of Mr. Yarrington, of Carbondale, Pennsylvania, we are indebted for the opportunity to examine an old file of the *Dundaff Republican*, published in Susquehanna County, Pennsylvania, for the year 1829. Under date of July 23, 1829, we find the following, announcing the arrival at Honesdale of the Stourbridge Lion from New-York, *via* Delaware and Hudson Canal:

"The boats begin to arrive with the travelling-engines and railroad machinery; all is bustle and business. The engine intended for this end of the road is a plain, stout work of immense height, weighing about seven tons, and will travel four miles per hour, with a train of thirty to thirty-six carriages, loaded with two tons of coal each; the engine is called the Stourbridge Lion, its boiler being built something in shape of that animal, and painted accordingly. Now imagine to yourself the appearance of that animal, the body at least twelve feet in length and five in diameter, travelling at the rate of four or five miles per hour, together with a host of young ones in train, and you will have some idea of the scene before us; but the enchantment is broken, and in a few days the whole will be set in motion, and we will now give you information that, when the whole is in operation, we shall

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give a general notice that we intend to hold a day of rejoicing on the completion of the same, and shall give a general invitation to our fellow-citizens to attend.

"We have procured a large cannon, and intend to station it on the top of the high peak, to sound on the occasion.

"A Strict Observer."

The following description of the locomotive Stourbridge Lion and its first experimental trip, from the pen of the Hon. John Torry, a resident of Honesdale, and a spectator of the events on that occasion, we will present in his own language:

"Honesdale, *March* 28, 1870.

"Wm. H. Brown, Esq.,—

"Dear Sir: Yours of the 16th inst., asking for information and particulars respecting the trial-trip of the first locomotive in Honesdale, came duly to hand. I have conversed with numerous persons who I thought would be likely to remember incidents concerning it, and have seen my brother, who kept my father's accounts in 1829 (but who was in Minnesota when C. F. Young, Esq., was seeking information).

"From his memorandum made at the time, the precise *date* of the trial is determined (viz., August 8, 1829). I have prepared a statement embodying so many of the incidents as it seems to me you would think of any interest, and probably including some which might better be omitted, as well as some which you will have obtained from other sources, and have appended as foot-notes such copies of the entries I have found as relate to the subject.

"The statements I have made are partly from *my own* knowledge, partly such as I have obtained from interviews with persons who were present, and whose statements I consider reliable, and partly from written memoranda, from which I have made extracts. You can use so much of it as you think advisable, and in such form as you please.

"Dr. Losey, to whom you wrote, died on the 9th inst.

"The first locomotive run by the Delaware and Hudson Canal Company, on their railroad at Honesdale, was constructed in Stourbridge, England (a manufacturing town on the river Stour, some fifteen miles westward from Birmingham).

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"Its plan of construction was much less simple than that of those now in use. From the great number of its rods and joints, some who were observers of its experimental trial on the road, describe it as looking like a mammoth *grasshopper*, having three or four times the usual number of legs. Its driving-wheels were of oak-wood, banded with a heavy wrought-iron tire, and the front was ornamented with a large, fierce-looking face of a *lion*, in bold relief, and it bore the name of '*Stourbridge Lion*.'

"This locomotive and two others, purchased by or made for the company in England, arrived in New York in May, 1829, and it was expected the company's railroad would be completed in time to have the celebration of the opening of the railroad, and of the running of the first locomotive upon it, on the 4th of July of that year. But the month August came before the railroad was so far completed that the formal opening could be attempted.

"The locomotive having been transported by canal to Honesdale, the 'Stourbridge Lion' was elevated, by the use of a temporary inclined plane, to the level of the railroad, and put in running order, and placed upon the rails; and every thing thus got in readiness for the trial. On Saturday, August 8, 1829, the fire was kindled and steam raised, and, under the management of Mr. Horatio Allen, the 'wonderful machine' was found capable of moving, to the great joy of the crowd of excited spectators. After running it back and forth on the portion of the road between the canal basin and the high railroad-bridge across the west branch of the Lackawaxen, Mr. Allen started it, with no person accompanying him, and without any car being attached, and ran it with good speed around the curve and across the bridge, and up the railroad about one and a half mile, to where the railroad was crossed by a common road-bridge, placed too low to admit of the passage of the locomotive under it. Here he reversed the engine and ran it back to the place of starting, greeted by the shouting cheers of the people and the booming of cannon. Mr. Alva Adams, a mechanic, while assisting to fire the cannon, had his arm so badly shattered that amputation became necessary.

"After repeating the trial a few times, the 'Stourbridge Lion' was removed from the track and left standing by the side of the railroad, with no covering but a temporary roof, until the approach of winter.

"These experiments demonstrated that the manner of construction of the railroad was not sufficiently firm and substantial

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for a locomotive-road, the rails being of hemlock-timber, six inches thick by twelve inches deep, keyed (or wedged) into gains cut in cross-ties of hemlock-timber, placed ten feet apart, with a flat bar of iron fastened by screws upon the top of the rail—the gauge (or width) of track being *four feet three inches.* They also demonstrated that the plan of construction of the locomotive was not such as to afford a probability of its being successfully used for the purpose designed, with any such changes in the road as were then deemed reasonable.

"The failure of success was a great disappointment, not only to the directors and stockholders of the company, but also to the community, who were interested in the prosperity of the county.

"While thus standing by the side of the railroad, it was an object of great dread to timid children who were obliged to pass by it; and many, now residing in Honesdale, remember the care they were accustomed to take, when children, to avoid passing near the fierce-looking 'lion.' In November, 1829, it was housed in with rough boards, as it thus stood beside the railroad, though some of the boards on the sides were soon displaced, to give opportunity *for the curious* to examine it more readily. It remained where thus housed some fourteen or fifteen years, until so many of its parts were detached or broken, that it was entirely disabled and considered worthless as a locomotive; when the boiler was removed to Carbondale, and used with a stationary engine in one of the company's shops, and the wheels, axles, and loose parts, were sold for old iron. Some of the loose parts are still kept as mementos of *the first locomotive run upon a railroad in America.* The boiler is now in use in Carbondale.

1870

"In the original 'Labor Account' kept by Mr. Stephen Torry, for his father's Honesdale business, in 1829, is the following entry:

"'SATURDAY, *August* 8, 1829.

"'The locomotive-engine "Stourbridge Lion" was started by steam this morning.—Alva Adams had his arm blown off while firing the cannon.

"'No work was done until after the middle of forenoon.'

"In the accounts kept by Stephen Torry for his father, in 1829, is a charge to the Delaware and Hudson Canal Company, under date of 'November 7, 1829,' for 'boards to cover the steam-engine.'

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"The foregoing extracts are true copies from the original papers relating to Jason Torry's business.

"Respectfully,

"JOHN TORRY."

Annexed we give a sketch of the "Stourbridge Lion" from an original drawing of the machine, together with a description of the engine by Mr. David Matthew, who had charge of the men who were employed to fit up the engine when it arrived in New York, and had been landed at the works of the West Point Foundery, New York.

Mr. Matthew writes, under date of December 6, 1859:

"The 'Stourbridge Lion' was a four-wheeled engine, all drivers, with all four wheels connected by pins in the wheels. The boiler was a round, cylindrical one; no drop part for the furnace, and the smoke-box had a well-painted lion's head on it. The cylinders were vertical, placed at the back and each side of the furnace, with grasshopper-beams and connecting-rods from them to the crank-pins in the wheels. The back wheels and the side-rods between them and the front wheels; the front end of the beams were supported by a pair of radius rods which formed the parallel motion. This engine was built by Foster, Rastrick & Company, at Stourbridge, England."

CHAPTER XVI.

MORE FACTS OF THE STOURBRIDGE LION.

IN September, 1829, a locomotive built by George Stephenson, at his works in Newcastle-upon-Tyne, arrived in New York and was to be seen, for some time, in the yard of E. Dunscomb, Water Street; its wheels

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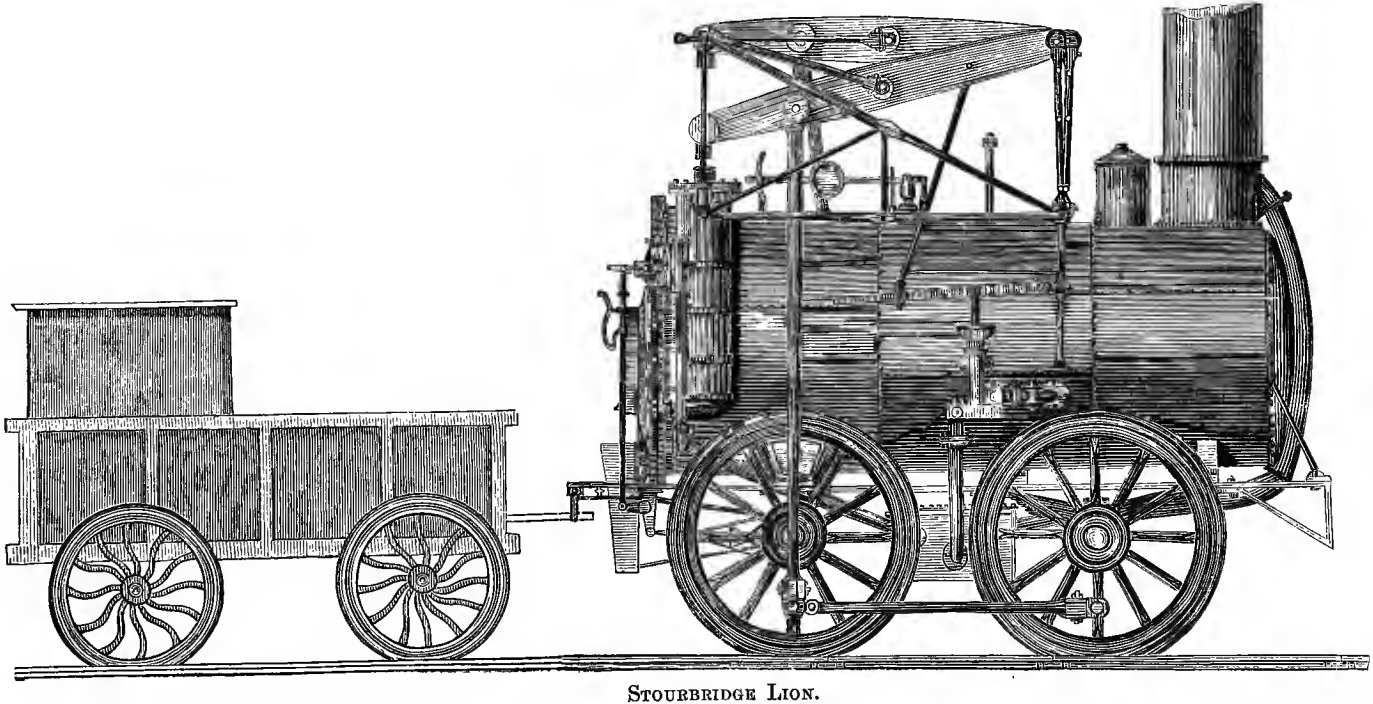

STOURBRIDGE LION.

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were raised above the ground and kept running for the amusement of the crowds attracted by its novelty. Of this engine Mr. Horatio Allen speaks in a letter to the author as follows:

"This locomotive, or motive (but not progressive motion), was not the engine which made the first run on the railroad at Honesdale, Pennsylvania. This engine (built by Stephenson at Newcastle-upon-Tyne) was set up at an iron-yard on the East-River side of New York, and being blocked up, so that the wheels could not touch the ground, the engine could go through the motions without running."

As we are determined that our history of the first locomotives in America shall lack no evidence to sustain the facts we record, we cannot close our testimony in the case of the "Stourbridge Lion" without removing an impression which many persons entertain, and have often declared to the author, that this same old engine, which came from England and made the first trip on a railroad in America, is still in existence somewhere in New England. Such is not the fact. Notwithstanding the testimony upon this point to be found in the latter part of the Hon. John Torry's letter to the author, where he distinctly records the ultimate fate of the Lion, we have another letter from an old citizen of that region, the same gentleman who favored us with the file of the *Dundaff Republican*, Mr. Dilton Yarrington, from which we will extract such parts as relate to the final disposition of this locomotive, thus:

"As far as the locomotive was concerned, it was considered a failure from the very first time it was used. It stood around for some years, and by degrees was taken to pieces and wasted away like an old cripple. I worked up some of the fragments of it in the shop in 1849.

. . . . "The boiler is now in use here in Carbondale, in a foundery, where it has been in use for twenty years past, and is

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still considered reliable. The iron plates composing it are full half an inch thick.

"Respectfully yours,
"D. YARRINGTON."

Mr. Yarrington was a blacksmith in the company's shops, an old citizen of that region, and lived in Dundaff from 1825 to 1847.

We will now close our description of the events incident to the first locomotive in America, by giving our readers Mr. Allen's account of his ride alone upon the "Stourbridge Lion," in a speech made by him in 1851, at Dunkirk, on the occasion of the celebration in honor of the completion of the New York and Erie Railroad, and transmitted by him to the author. After alluding in terms of commendation to those who, by their talents and perseverance, had carried through to a successful completion the great work just finished, Mr. Allen continued:

"Having occupied your time with these statements of perhaps no great interest, but the omission of which would have been an act of injustice, I have thought that, on this great railroad occasion, a reference to some of the incidents in the early railroad history of this country might be appropriate. To bring before you as strikingly as in my power, it has occurred to me to lead your imagination to the conception of the scene which would present itself if, on some fine morning, you were placed at an elevation, and gifted for the moment with a power of vision which would command the railroad movements of the whole United States. There would be presented an exciting picture of activity, in a thousand iron horses starting forth from the various railroad centres, or traversing the surface of the continent in all directions. When the imagination has attained to some conception of the scene, let it seek to go back to the time when only one of these iron monsters was in existence on this continent, and was moving forth, the first of his mighty race. When was it? where was it? and who awakened its energies and directed its movements? It was in the year 1829, on the banks of the Lackawaxen, at the

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commencement of the railroad connecting the canal of the Delaware and Hudson Company with their coal-mines, and he who addresses you was the only person on that locomotive.

"The circumstances which led to my being left alone on the engine were these: The road had been built in the summer, the structure was of hemlock-timber, and the rails, of large dimensions, notched on to caps placed far apart. The timber had cracked and warped, from exposure to the sun. After about five hundred feet of straight line, the road crossed the Lackawaxen Creek on a trestle-work about thirty feet high, and with a curve of three hundred and fifty or four hundred feet radius. The impression was very general that the iron monster would either break down the road or that it would leave the track at the curve and plunge into the creek. My reply to such apprehension was, that it was too late to consider the probability of such occurrences; that there was no other course but to have the trial made of the strange animal which had been brought here at such great expense, but that it was not necessary that more than one should be involved in its fate; that I would take the first ride alone, and that the time would come when I should look back to this incident with great interest. As I placed my hand on the throttle-valve handle I was undecided whether I would move slowly or with a fair degree of speed; but believing that the road would prove safe, and preferring, if we did go down, to go down handsomely and without any evidence of timidity, I started with considerable velocity, passed the curve over the creek safely, and was soon out of hearing of the cheers of the large assemblage present. At the end of two or of three miles, I reversed the valves and returned without accident to the place of starting, having thus made the first railroad trip by locomotive on the Western Hemisphere."

Our readers are doubtless now satisfied that to the Delaware and Hudson Canal Company is justly due the credit of having introduced and run upon their railroad the first locomotive that made a revolution with its driving-wheel upon the American Continent. And although this engine proved to be impracticable under the circumstances, it was caused by no defect in its construction, or the principle involved, nor from a lack of

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power and ability to perform all the duties that might have been required; but from this cause alone, that the road had not been built to sustain such a weight as it was called upon to bear when this new instrument of power was placed upon it. The road had been constructed for horse-power alone, as all other roads were in this country at that early period, and for a long time after, even in England. No idea of a locomotive had then been conceived in this country. Nevertheless, these machines were the forerunners of a mighty race of iron monsters, which only twoscore years after were to be seen traversing every section of the country, even stretching their course from the Atlantic to the Pacific.

We will now leave the "Stourbridge Lion" where we last heard of it, by the road-side, snugly stowed away in a shed, constructed of hemlock-boards, purchased from Jason Torry, Esq., as it appears from the copy of the original entry in his books, in November, 1829, and pursue our history a few years later, by recording events which soon after followed the advent of the Lion.

CHAPTER XVII.

FIRST MEETING OF THE BALTIMORE AND OHIO RAILROAD COMPANY.

The first meeting for the purpose of forming a railroad company in the United States, to connect the waters of the East with the waters of the West, was held in the city of Baltimore, on the 12th day of February, 1827. The practicability of the project was left to a

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committee who soon after reported at the second meeting, on the 19th, and a resolution was passed to obtain a charter from the Legislature. The charter was obtained, and on April 24, 1827, the company was organized, and the first board of directors elected.

The construction of the road was commenced by laying a corner-stone, July 4, 1828, attended by one of the most magnificent processions of the military and civil associations, trades, and professions, ever witnessed on any occasion in the United States. The author was in Baltimore at that time, and participated as one in the vast crowd assembled to take part in the imposing ceremonies of that eventful day. Never in his life (and he has been present on many demonstrations on other occasions) has he witnessed a more magnificent display than was made on that day.

The venerable Charles Carroll, of Carrollton, then over ninety years of age, the only survivor of the signers of the Declaration of Independence, was present on the occasion and laid the corner-stone of this stupendous fabric, with appropriate ceremonies. It is related that, on this occasion, after the imposing ceremonies were over, the venerable patriot made use of the expression to one of his friends present: "I consider this among the most important acts of my life, second only to my signing the Declaration of Independence, if even it be second to that;" and to the end of his life he continued a firm friend of the work.

The construction of the Baltimore and Ohio Railroad was commenced in 1828, and completed in 1852. On January 12, 1853, in honor of the completion of the road, a magnificent banquet took place in Wheeling, its western terminus. At that time it was the longest railroad in the world.

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At this banquet Mr. Swann, the president of the company, in his address, made this beautiful allusion to the venerable and patriotic Carroll: "There are those present who witnessed the enthusiasm which attended the laying of the first stone, by the illustrious Charles Carroll, of Carrollton. *Clarum et venerabile nomen.*" He then produced the trowel which had been used by Mr. Carroll, and was still preserved by the company, with this memorandum on it: "This trowel was used by Charles Carroll, of Carrollton, to lay the first stone of the Baltimore and Ohio Railroad, July 4, 1828." This interesting relic was received by the assembled company with rapturous applause. Mr. John B. Morris, who delivered the address for the president and directors, took occasion to remark of Mr. Carroll, in connection with the interesting event: "In the full possession of all his mental powers, with his feelings and affections still buoyant and warm, he now declares that the proudest act of his life, and the most important in its consequences to his country, was the signature of the Declaration of Independence; the next, the laying of the corner-stone of the work which is to perpetuate the union of the American States, and to make the East and the West as one household in the facilities of intercourse and the feelings of mutual affection." Benjamin H. Latrobe, Esq., then followed in a few brief remarks, in reply to the beautiful and flattering allusion made to his services by the president of the road. Mr. Latrobe was the chief engineer of the long work just completed, and to his great energy and ability, as well as to his indomitable perseverance in overcoming all obstacles, the success of this stupendous undertaking is largely to be attributed. To the kindness of Mr. Latrobe, also, is the author indebted for much of the

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valuable information contained in these pages, and also for the pen-and-ink drawing of the Peter Cooper engine, of which we will speak in its proper place, and the sketch and experiments of Mr. Thomas's sailing-car and several other machines that succeeded it.

As soon as the corner-stone of the road was laid, preparations were made to push the work through with as much energy and expedition as could be exercised in the manner of construction for a railroad deemed absolutely necessary at that early day. The amount of expense involved in the prosecution of this work, when compared with the construction of railroads at the present day, only fills our minds with the more wonder and admiration at the boldness displayed by the projectors of such a stupendous undertaking as the Baltimore and Ohio Railroad. We will briefly describe the mode of construction of this early road, as it will no doubt prove interesting to our readers who are only conversant with the present method of building railroads. The method of construction was reported to the author by a gentleman now living in Baltimore, who was engaged in one of the branches of the enterprise at the time, thus:

"After the ground was brought to a level for the track, two square holes were dug, four feet apart, twenty inches wide, two feet long, and two feet deep. In these holes broken stones were put, sufficient to fill to the surface. They were then securely rammed down. Each particle of stone was tested and passed through an iron ring, to insure its proper dimensions. On this point great care was taken that every stone should be of the uniform size required. After the foundation is made, a trench six inches deep, and filled with stone, broken and tested with the ring as at first, is extended across the track from one of the filled-up holes to another opposite, upon which a sleeper made of cedar, seven feet long, is laid. By this process the foundation of the

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rails is protected from the effects of dampness or frosts, and firmness and stability are imparted to it. These cedar cross-pieces were laid with great accuracy and care; a spirit-level was used to adjust them properly. In each end of these cedar cross-pieces, immediately above the stone foundation, notches were cut and carefully levelled; into these notches were laid wooden rails or string-pieces, and securely kept in their places by wedges. These string-pieces were of yellow pine, from twelve to twenty-four feet long and six inches square, and slightly bevelled on the top of the upper side, for the flange of the wheels, which at that time was on the outside. On these string-pieces iron rails were placed and securely nailed down with wrought-iron nails, four inches long. The earth between these cedar sleepers was carefully removed, so as not to come in contact with the bottom of the string-pieces, and thus the decay, which otherwise might take place, was prevented. Yet, with all these difficulties to contend with, our pioneers of the Baltimore and Ohio Railroad persevered until they brought their work to a successful termination. After several miles of this description of road had been made, long granite slabs were substituted for the cedar cross-pieces and the yellow-pine stringers. Beyond Vinegar Hill, these huge blocks of this solid material could be seen deposited along the track, and gangs of workmen engaged in the various operations of dressing, drilling, laying, and affixing the iron.

"When the track was finished to Vinegar Hill, a distance of about seven miles, cars were put upon it for the accommodation of the officers, and to gratify the curious by a ride."

CHAPTER XVIII.

FIRST BRIGADE OF CARS.

Some of the newspaper notices of the events of that day, and the schedules advertised by the company, will no doubt be interesting to our readers and to railroad men of the present time. We will give them as we

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copied them from old files of the Baltimore newspapers. The *Baltimore American*, May 20, 1830, said:

"We understand that a critical examination of the entire line of the first division of the Baltimore and Ohio Railroad, between this city and Ellicott's Mills, was made on Thursday last, by the president and engineer of the company, for the purpose of testing the solidity of the work. A car was loaded with double the weight intended hereafter to be transported on a single wagon, and was passed over the whole of the first and those parts of the second track which are finished, and it is highly gratifying to learn that, notwithstanding the recent heavy rains, which have placed the work in the most unfavorable condition, it sustained the pressure to the entire satisfaction of those interested in the work. About seven and a quarter miles of the single track are laid on wooden sleepers, and the remaining six and three-quarter miles on stone slabs. Such is the stability of this mode of construction that, in about 16,000 blocks, only forty were observed to be the least affected by the pressure. The horse-path and 'turn-outs' are finished, and the necessary arrangements for horses and drivers having been already made, we understand that it is the intention of the company to open the road for public travel on Monday next, the 24th inst."

The *Baltimore American*, May 24, 1830, said:

"A brigade of cars will run three times a day each way from Baltimore to Ellicott's Mills—passage 25 cents.

"This morning at nine o'clock, in pursuance with previous arrangements of the mayor and the members of the two branches of the City Council, the president, directors, engineer, and officers, of the Baltimore and Ohio Railroad, the editors of the different papers of the city, and a number of strangers, left the depot at the intersection of the railroad with Pratt Street, on an excursion to Ellicott's Mills. The procession was headed by the splendid car Pioneer, in which, together with a number of others, rode the venerable Charles Carroll, of Carrollton. Although the brigade was of large dimensions and filled with passengers, it was drawn with great ease by one horse at a rapid rate. The appearance which they presented was novel and interesting in the extreme. A great number of persons, attracted by the novelty of the sight,

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attended at the depot and along the course of the road, and all, as far as we could learn, were unanimous in the expression of the opinion that the experiment was calculated to dissipate the doubts of those (if there be any such) who are yet skeptical as to the manifold advantages of this over all other modes of fostering our internal commerce.

"P. S.—Since the above was written, we learn that the party of excursionists had returned, accomplishing the distance (thirteen miles) in one hour and four minutes."

Another extract reads as follows:

"The weather yesterday being remarkably mild and pleasant, vast numbers availed themselves of the opportunity to examine the road and viaduct, and enjoy the gratification of a ride in one of Winans's carriages. The Hon. the Postmaster-General, having reached the city, and being desirous of visiting the road, accompanied the gentlemen attached to the road. A carriage being brought out, the party, consisting of twenty-four ladies and gentlemen, including the Postmaster-General, were drawn to the viaduct by one horse, in actually a little less than six minutes. After alighting to view the magnificent granite structure, the party again seated themselves, and were conveyed back to Pratt Street at the extraordinary rate of fifteen miles per hour. In order to show the perfect ease and rapidity with which heavy loads can be transported over well-constructed railroads, three carriages were attached to each other, and, being filled with more than eighty persons, were rapidly drawn by one horse, at the rate of eight miles per hour. Average each person at 150 lbs., and estimate the carriages at two and a half tons, a single horse actually drew a load of eight and a half tons, at a speed of eight miles per hour, and this extraordinary result was accomplished without any apparent distress to the animal, or indeed uncommon exertion on his part."

In another number of the *American*, we read that an experiment was made for the transportation of two hundred barrels of flour, with a single horse, with the most triumphant success. The flour was deposited in a train of eight cars, and made, together with the cars

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and the passengers, an entire load of thirty tons. The train was drawn, from Ellicott's Mills to the Relay House, six and a half miles in forty-six minutes. The horse was then changed, and the train, having again started, reached the depot on Pratt Street in sixty-nine minutes, thus accomplishing the thirteen miles in one hour and fifty-four minutes, or at the rate of six and three-fourths of a mile an hour.

We will close these extracts with the following copy of an advertisement, made forty years ago, for the Baltimore and Ohio Railroad:

"RAILROAD NOTICE.—A sufficient number of cars being now provided for the accommodation of passengers, notice is hereby given that the following arrangements for the arrival and departure of carriages have been adopted, and will take effect on and after Monday morning, the 5th inst., viz.: A brigade of cars will leave the depot in Pratt Street at 6 and 10 o'clock A. M. and at 3 to 4 o'clock P. M., and will leave the depot at Ellicott's Mills at 6 and at 8½ o'clock A. M., and at 12½ and 6 o'clock P. M.

"Way-passengers will provide themselves with tickets at the office of the company in Baltimore, or at the depot at Pratt Street or Ellicott's Mills, or at the Relay House, near Elk Ridge Landing.

"The evening way-car for Ellicott's Mills will continue to leave the depot, Pratt Street, at 6 o'clock P. M. as usual.

"N. B.—Positive orders have been issued to the drivers to receive no passengers into any of the cars without tickets. P. S. —Parties desirous to engage a car for the day, can be accommodated after July 5th."

When we compare our present mode of travelling from one city to another, over hundreds and thousands of miles by railroads, being comfortably seated in the most magnificent cars by day, and snugly resting by night in commodious sleeping-cars, we cannot refrain from wonder in attempting to conceive how our forefathers, forty years ago, could content themselves to make a journey

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even in the most urgent cases, and at all seasons of the year, in the old-fashioned stage-coaches over a rough turnpike, or in canal-packets. But at that time nothing better was known; and the fast line of stages, and the packet-line on the canal, were the best the country could boast of, if we except the beautiful steamers that navigated some of our rivers. The early methods of travelling when railroads were first brought to notice were only one remove, in convenience and improvement, from those we have just described.

In connection with the early operations of the Baltimore and Ohio Railroad, as compared with the present, the following "travelling memoranda," published in the *New-York Gazette*, in May, 1831, furnish some reminiscences worthy of preservation.

"TRAVELLING MEMORANDA.

"*Messrs. Lang, Turner & Company:*

"Having, last week, business in Philadelphia, Baltimore, and the city of Washington, I started at six A. M. on Monday. In order to show the facilities afforded at the present day to do much business in a short time, I send you a sketch of my excursion.

"Left New York at six A. M. on Monday. Arrived in Philadelphia at five P. M. Called on four persons. Settled my business with them by nine. Went to bed; and started on Tuesday morning at six for Baltimore, where I arrived at five P. M. Got through with my business there at half-past nine. Went to bed. Started at four A. M. on Wednesday for Washington, and arrived a little after nine A. M. Dressed, called on the President, and finished my business with him. Dined at Gadsby's. Took a hack in the afternoon, rode several miles, and completed my business with four persons. Took tea with a friend. Slept at Gadsby's. Started at four A. M. on Thursday, on my return. Arrived at Baltimore at ten, visited the cathedral, Washington Monument and the waterworks, before dinner. Dined at Barnum's splendid hotel. Partook of a bottle of wine with three Albanians; at three mounted a car, with twenty-two passengers, on railroad. Visited Ellicott's Mills, thirteen miles from Baltimore. Returned to Baltimore before

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dark. Took tea, and afterward, in a hack, visited the venerable Mr. Carroll, of Carrollton. Returned to Barnum's. Went to bed; and started for Philadelphia, where I arrived at half-past six P. M. Made several friendly visits. Went to bed. Started on Saturday and reached New York at half-past five the same day. Was thus absent nearly six days—travelling about six hundred miles, and completing all my business at the expense of forty dollars and seventy cents.

"The observations that I made were, that Baltimore and Philadelphia are looking up. In both places the bustle of business reminded me of home, that is to say, New York. The canal which connects the Delaware with the Chesapeake, through which I passed in two hours, is a great and useful work. The railroad, which already passes several miles beyond Ellicott's Mills, is a most delightful and useful mode of conveyance. The car in which I took my passage to Ellicott's Mills (four others in company) contained twenty-two passengers, drawn by one horse, and the time going the thirteen miles was one hour and a quarter. By the 1st of July the locomotives will be in operation upon the railroad, when the same distance will be travelled in thirty minutes.

"Yours, etc., J. L."

Those who have seen and travelled only in the comfortable and convenient passenger-cars of the present day cannot comprehend the tedious progress with which such improvements have been made.

The first passenger-car was like a market-car on railroad-wheels. Then came cars resembling the old-fashioned stage-coach, with the same springs and leather braces, and carrying nine passengers each, with a driver's seat perched upon either end, as there was no such contrivance as a turn-table at that early day. For a long time the cars were gaudily painted, with a small increase in the size. One of those, built by Mr. Richard Imlay, is thus described in the *Baltimore American*, August 4, 1830:

"A number of persons visited Monument Square, yesterday, for the purpose of examining a very elegant railroad passenger-

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carriage, just finished by Mr. Imlay, and intended to be immediately placed on the road.

"The arrangement for the accommodation of passengers is, in some respects, different from any other which has yet been adopted. The body of the carriage will contain twelve persons, and the outside seats at either end will receive six, including the driver. On the top of the carriage is placed a double sofa, running lengthwise, which will accommodate twelve more. A wire netting rises from two sides of the top of the carriage, to a height which renders the top seats perfectly secure. The whole is surmounted by an iron framework, with an awning to protect from the sun or rain. The carriage, which is named the 'Ohio,' is very handsomely finished, and will, we have no doubt, be a great favorite with the visitors to the railroad, the number of whom, we are gratified to learn, continues to be as great as it was at the opening of the road."

CHAPTER XIX.

ROSS WINANS'S IMPROVEMENTS.

The road to Ellicott's Mills was opened on May 24, 1830. Trains of cars like the above were called brigades, and were continued until Ross Winans, Esq., placed upon the track the first eight-wheel car ever built for passengers, and called it by the appropriate name of "Columbus." This car was a large box, such as any carpenter could make; it had a truck of four wheels at either end, the same as the eight-wheel cars of the present time; it also had seats on the top, like the other cars hitherto used, which were reached by a ladder at one of the corners. This was followed by several odd-shaped contrivances; one was nicknamed the "Sea-serpent," another was known by the

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sobriquet of the "Dromedary;" next came the Winchester pattern; and this was followed by the "Washington," each an improvement on its predecessor. The latter resembled three coach bodies combined in one, and divided in the interior into three separate apartments, and entered by doors on each side of each apartment. The author remembers well, as if but yesterday, riding in cars of this construction, in October, 1833, upon the railroad between South Amboy and Bordentown, which connected by steamboats both with New York and Philadelphia. As the passengers landed and approached the cars to take their seats, each car appeared surmounted with the letter A, B, C, etc., in order, and each apartment was numbered 1, 2, or 3. Thus the passenger, on examining the ticket furnished to him on the steamboat, entered the car and apartment designated thereon. These carriages continued on all the roads then operating between the principal cities—as Boston and Providence, Philadelphia and New York, Philadelphia and Baltimore, and Baltimore and Washington—until the eight-wheel passenger car was brought into use, with the passage-way the entire length between the seats, which were placed on the sides, as at present.

When the design for this style of car came before the board of directors of the Baltimore and Ohio Railroad Company, there was quite a discussion whether there should be an aisle in them, with entrances at each end, and seats as at present, or whether the cars should be in compartments, with entrances at the sides, with a ledge outside for the conductor; and one of the arguments against the aisle, verified by the result, as we know, was the apprehension that it would often be one long spittoon! The possibility of this was admitted;

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but other considerations prevailed in favor of the aisle, which has continued to the present day.

Horatio Allen, Esq., in one of his letters to the author, once said, in alluding to the improvements in every department of railroad machinery, locomotives, cars, etc.:

"It is generally believed that the railroad system was imported into this country from England, full grown, but such is not the case. This will be exemplified in no better instance than the fact that in September, 1832, steel springs were first placed upon the locomotive 'York' and tender, as an experiment only, and they demonstrated their utility and necessity in regulating the motion and greatly diminishing the jar and consequent injury to the road. This also suggested the propriety of making a further experiment, by placing some of the burden-cars on springs, by which it was found that they admitted of one-third more loading, without any increase of damage to the road or car."

Two years earlier than this, however, other and important improvements had been made. One of the great desideratums in the beginning of railroad enterprise in this country, and to which no example could be applied, was a plan to reduce the large amount of friction.

In the early period of the Baltimore and Ohio Railroad, when no one dreamed of steam, horses were expected to do the work, and to reduce the friction of the axles in the boxes was the object to be achieved. In this extremity, Ross Winans, Esq., now living, a venerable citizen of Baltimore, came to the rescue with his inventive genius. Dr. William Howard, an accomplished and scientific gentleman, had already patented the application of the ordinary friction-wheel to a car, where the main journal revolved on the exterior periphery; but Mr. Winans suspended his wheel by a projecting flange, on the interior periphery of which the

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main axle revolved. This was the *ne plus ultra* of the friction-wheel, and Mr. Winans became immortalized. B. H. Latrobe, Esq., describes a scene in one of the upper rooms of the Baltimore Exchange, where the venerable Charles Carroll, of Carrollton, who was the great man, on all important occasions, was seated in a little railroad car, drawn by a small weight attached to a string passing over a pulley and dropping into the hall below. Around him were all the prominent men of Baltimore; all were as much pleased as children with a new toy. In fact, there was a verdant freshness about all railroad objects in those days which it is wonderful to conceive in this period of advance and improvement.

Not only was friction sought to be avoided, but all sorts of experiments were tried, to improve the road.* To ride in a railroad-car, in those days, was literally to go "thundering" along. The roll of the wheel was hammering the iron rails out of existence. When this became known, after tens of thousands of dollars had been thrown away, one of the directors, a man, too, of general information, proposed to lay a thin slab of lead between the iron and the stone, to relieve the concussion. Luckily, this costly experiment, which would have furnished the sportsmen of the interior with slugs and bullets without cost, was not carried into effect. We only mention this now, to show how crude were the notions of the wisest men, touching railroads in their infancy, in this country, and to indicate the obstacles our forefathers had to contend with in the early days of their construction. With no example before them to follow, with no experience before them to govern, every thing had to be tested by actual experiment.

* Iron strips were laid, for miles and miles, on stone curbs, on the Baltimore and Ohio Railroad.

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The first locomotive ever built in the United States was constructed to determine a principle, at that early period, susceptible of a great diversity of opinions, even among the engineers and scientific men of that day, viz., the ability of a locomotive to keep upon the track in running a curve. When steam made its appearance on the Liverpool and Manchester Railroad, in England, it attracted much attention in this country, and the question of its early adoption became the subject of a great deal of speculation and argument. There was this difficulty in the way of introducing an English engine upon an American road: In England the roads were virtually straight, or with very long curves; but in America they were full of curves, sometimes of as small a radius as two hundred feet. There was not capital enough in the United States, applicable to railroad purposes, to justify engineers in setting Nature at defiance in their construction. If a tunnel through a spur could be saved, in an American railroad, by a track round it, the tunnel would be avoided, and a circuitous route adopted, although the distance was increased for miles in consequence; so, if embankments could be saved by heading valleys in place of crossing them, it was done. This led to sharp curves upon the American roads, where there would be straight lines in England.

No better illustration of this is to be seen than near the Relay House, or Washington Junction, of the Baltimore and Ohio Railroad, where the curve, as the road turned into the gorge of the Patapsco, was originally located, with less than three hundred feet radius, to avoid the necessity of the cut that has since been made through the rocky northern jaw of the gorge. A tunnel, too, is now cut at the Point of Rocks, through the hard intractable material which is there met with, in a spur

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of the Catoctin Mountain. In the first instance, the road was located to avoid it.

CHAPTER XX.

EXPERIMENTAL LOCOMOTIVES.

The first locomotive, then built to demonstrate its adaptability to a curved road, was constructed by Mr. Peter Cooper, of New York, long and most favorably known as the founder of the far-famed Cooper Institute in that city. Mr. Cooper's locomotive was built at the St. Clair Works, near Baltimore, and was first run upon the Baltimore and Ohio Railroad in the summer of 1829, nearly two years before that first really successful locomotive (as it was described in the *Ledger*, and built by Messrs. Tyler and Baldwin) was tried upon the Germantown and Norristown Railroad, in 1832. What success Mr. Cooper's locomotive displayed on its first trial-trip we will describe:

The Baltimore and Ohio Railroad, as we have before stated, was the first of any extent begun in America; and the first built for the purposes of trade and commerce, as nearly all are at the present day. Previous to the year 1826, no railroad, even in England, had been constructed for the general conveyance of passengers or merchandise between two distant points. A few railroads had been constructed for local purposes, such as the conveyance of coal or ores from the mines to the points of shipment on navigable streams; but, for general purposes of travel or transportation, they were still regarded as an untried experiment, and the question had

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not been settled whether stationary engines or horse-power would be the most available. The Stockton and Burlington Railway, the Killingsworth, and several others in England, all coal-roads, had experimented with locomotives, but no one of them was satisfied that the locomotive would ever advantageously supersede horse-power. The Liverpool and Manchester Railroad had just been completed, but the question had not been settled what power should be used upon it. The same might be said of railroads in America—one or two short roads, for mining purposes, having been constructed, using horse-power.

We have devoted the foregoing remarks to the early history of the Baltimore and Ohio Railroad, not only from the fact that it was the first railroad in the United States, constructed for the actual traffic and commerce of the community between two distant sections of the country, the far-off West with the East, but because it was the railroad upon which the first locomotive built in the United States was successfully introduced. We allude to the machine constructed by Mr. Peter Cooper, in 1829;* and, although this was but a liliputian affair, it nevertheless became the forerunner of a race of iron giants who sprang into existence as soon as the principle was established, for the demonstration of which Mr. Cooper had brought forth his "Tom Thumb" locomotive. The cause which led him, at this time, to deviate from the path of his legitimate business, to become the builder of the first American locomotive, will be better explained by the perusal of his letter to the author, in answer to some inquiries upon that subject, dated

* First experiment made in that year, then altered and successfully experimented with in 1830.

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NEW YORK, *May* 18, 1869.

MR. WILLIAM H. BROWN—

"MY DEAR SIR: In reply to your kind favor of the 10th inst., I write to say that I am not sure that I have a drawing or sketch of the little locomotive placed by me on the Baltimore and Ohio Railroad, in the summer of 1829, to the best of my recollection.

"The engine was a very small and insignificant affair. It was made at a time when I had become the owner of all the land now belonging to the Canton Company, the value of which, I believe, depended almost entirely upon the success of the Baltimore and Ohio Railroad.

"At that time an opinion had become prevalent that the road was ruined for steam locomotives, by reason of the short curves found necessary to get around the various points of rocks found in their course. Under these discouraging circumstances many of the principal stockholders were about abandoning the work, and were only prevented from forfeiting their stock by my persuading them that a locomotive could be so made as to pass successfully around the short curves then found in the road, which only extended thirteen miles, to Ellicott's Mills.

"When I had completed the engine, I invited the directors to witness an experiment. Some thirty-six persons entered one of the passenger-cars, and four rode on the locomotive, which carried its own fuel and water; and made the first passage, of thirteen miles, over an average ascending grade of eighteen feet to the mile, in one hour and twelve minutes. We made the return-trip in fifty-seven minutes.

"I regret my inability to make such a sketch of the engine as I would be willing to send you at this moment, without further time to do so.

"Yours with great respect,

"PETER COOPER."

The following letter from Benjamin H. Latrobe, Esq., the chief engineer of the Baltimore and Ohio Railroad during its construction, addressed to the author, and containing a description and sketch of the sailing-car invented by Mr. Evan Thomas, and experimented with upon the road, and also his promise of a future sketch

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of the Peter Cooper locomotive, will no doubt be interesting to our readers:

EAST HAMPTON, LONG ISLAND, *August* 4, 1869.

WM. H. BROWN, ESQ.—

"DEAR SIR: Your letter to me, of the 26th July, has been forwarded to me at this place, where I am on a visit with my family. It will give me pleasure to give you what information I can upon the subject upon which you inquire, but I cannot do this so well here, as I could after my return to Baltimore, and communicating with my brother, who, as counsel of the Baltimore and Ohio Railroad Company, entered its service a couple of years before I did, as a subordinate in the engineer corps, on the 1st of July, 1830.

"I well recollect the little experimental locomotive of Mr. Peter Cooper, and also the sailing-car of Mr. Evan Thomas; but I could not give you a reliable sketch of the former at present, but, as to the latter, it was 'a basket body,' like that of a sleigh, and had a mast, and, if I recollect, 'a square sail, and was mounted upon four wheels of equal size.' It ran equally well in either direction, but of course only in that in which the wind happened to be blowing at the time, although it would go with the wind abaft the beam, but at a speed proportioned to the angle with a line of the sails. It was but a clever toy, but had its use at the time in showing how little power of propulsion was necessary upon a railway, compared with the best of the roads that had preceded it. Mr. Cooper's engine had, I remember, a vertical tubular boiler, and he was, at the time of its being placed on the Baltimore and Ohio Railroad in the summer of 1829, regarded as the first suggester of that form of boiler,* although Mr. Booth, the treasurer of the Liverpool and Manchester Railway, had proposed it for the Rocket engine about the same time; upon this point, however, I am not posted. Were I at home I would refer to some books and memoranda there, which, together with an interchange of recollections with my brother, would enable me to speak more specifically. The mode of applying the power to the wheels I do not remember. I had just entered the company's service, and my thoughts were directed more to learning the use of the levelling instrument and transit, and how to run curves with the latter, than to the rolling machinery of the railroad.

* Mr. Cooper has since informed the author that, for want of regular tubes (not then ever used), he substituted gun-barrels for tubes.

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"I recollect very distinctly, however, a trip which this little locomotive of 'Alderman Cooper's,' as he was then called, made to Ellicott's Mills, where I was stationed. It must have been in July or August, 1830. It brought out several of the directors, and my brother was one of the party, and I remember following it a little distance down the road, after it had started with much puffing and leaking of steam from some of its joints.

"It was in size (and power too, I might say) about the scale of Evan Thomas's sailing-car; yet it was, as the first step in the use of steam on that road, a highly important one.

"Its fuel, I think, was anthracite coal, the use of which, in the engines which succeeded it, was a favorite idea with the company, and influenced the form of the locomotives employed upon the road for several subsequent years.

"The Baltimore and Ohio Railroad, stimulated by the example of the Liverpool and Manchester Railway, next year (1830) offered a premium of $500 to the constructor of the locomotive which would draw fifteen tons, gross weight, fifteen miles an hour. This advertisement brought upon the road an odd collection of four or five original American ideas, of which it is much to be regretted that photographs and indeed detailed drawings have not been preserved. Among these was a rotary engine, by a Mr. Childs, which, I believe, never made a revolution of its wheels, certainly not in the form of *the locomotive.* The engine which took the premium was built by Mr. Phineas Davis, which was the model for those built after it for three or four years.

"I cannot add more just now, and, as I shall not be in Baltimore (except to post this) for three or four weeks, I must delay writing until then.

"Respectfully and truly yours,

"Benjamin H. Latrobe."

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CHAPTER XXI.

PETER COOPER LOCOMOTIVE.

Mr. Latrobe's next letter informed the author that he had then a rough sketch of the Peter Cooper machine, taken by his brother, John H. B. Latrobe, Esq., counsellor for the company; but he desired to submit the sketch to Mr. Ross Winans, for his examination and opinion, before he transmitted it.

Baltimore, *November* 20, 1869.

Wm. H. Brown, Esq.—

"Dear Sir: I have now seen Mr. Winans, and shown him the rough sketch of the Peter Cooper locomotive, referred to in my former letter. I send, upon the next page, a copy of the sketch, which presents as near an approach to a picture of the machine as at this distant day is possible to exhibit. Mr. Ross Winans tells me that Mr. Cooper brought the boiler from New York, in the spring or early in the summer of 1829; and it was on a frame, and rested on four wheels belonging to the company; the road was then used thirteen miles to Ellicott's Mills, and with horse-power. The boiler was tubular, and upright in position. Mr. Winans does not recollect the dimensions of it, although he says it lay in his shops for several years. He thinks it was not more than twenty inches in diameter, and, perhaps, from five to six feet high. There was a single cylinder of three and one-quarter inches in diameter, fourteen and one-quarter inches stroke, that projected its piston-rod and connecting-rod, so as to take hold of the crank by direct action.

"On the crank-shaft, which rested on the frame of the car, was a spur-wheel which geared with a pinion on the forward road-wheels so as to increase speed; the road-wheels being only two and one-half feet in diameter.

"The fuel was anthracite coal, and an artificial draught, in the fire-box at the bottom of the boiler, was created by a fan, driven by a belt passing around a wooden drum attached to one of the road-wheels, and a pulley on the fan-shaft as shown in the sketch.

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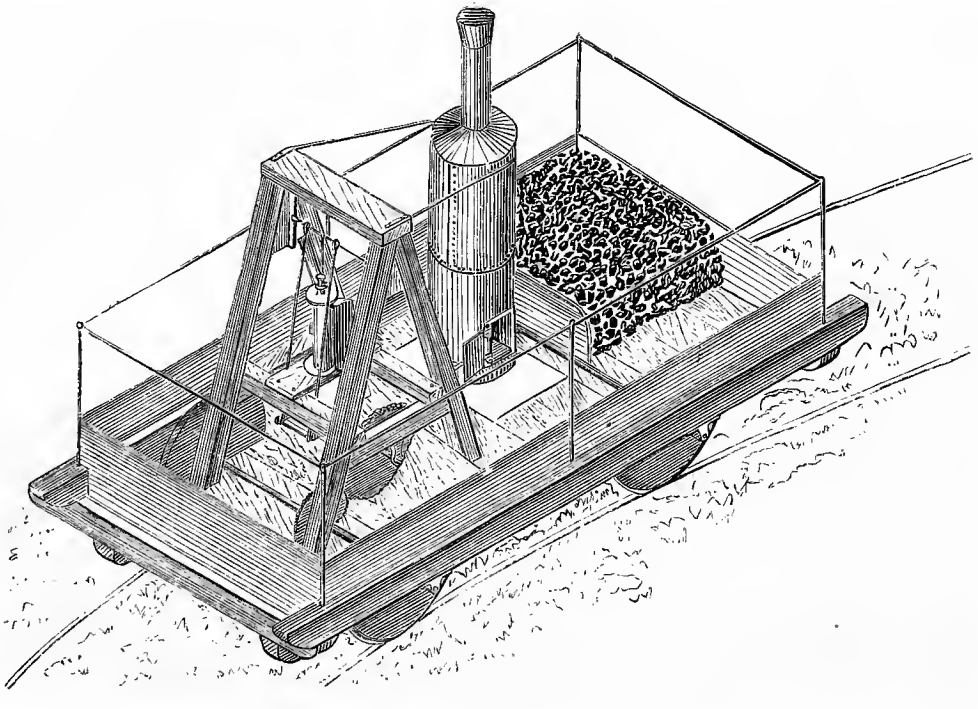

BIRDS-EYE VIEW OF PETER COOPER'S LOCOMOTIVE.

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"Mr. Winans says that Mr. Cooper at first proposed to communicate the reciprocating motion of the piston-rod to the road-wheels by an arrangement which I cannot accurately describe, but the experiment did not satisfy Mr. Cooper on trial, and the common crank action was substituted, and the favorable results obtained, which are described in Mr. Winans's letter of August 28, 1830, published in the *Railroad Record* of Cincinnati, on the 8th of July last. Mr. Cooper, if applied to, could perhaps furnish some interesting additional particulars about this engine, which was undoubtedly the *very first* American locomotive.

"Mr. Winans, after examining the sketch, pronounces it substantially correct as to the general features of the engine; the details, many of course ideal, must be very defective. The number, size, and length of the tubes are not known, only their position in the boiler.

"The road-wheels were two and a half feet in diameter; the axles had outside bearings upon Winans's friction wheels. The axle on which the pinion was fixed was kept from lateral or longitudinal movement, so as to preserve its position with respect to the spur-wheel.

"Your friend's sketch of the horse-car, you sent for my inspection, gives the general idea of it, and it is made with a spirit that shows him to be a good draughtsman and knowing to the 'points of a horse,' better than myself—the thing was as much like one of those horse-powers, of which we see so many, along railways at the stations, for cutting-up wood for the locomotives. The hinged or slatted platform, on which the horse walked, turned round a drum; on this was a spur-wheel working in a pinion on the road-wheel axle; so that this gearing gave considerable speed to the car, with a moderate one to the horse. I remember well the adventure with the cow, mentioned by my brother in his lecture, to which you refer. I agree with him and Mr. Winans that the successful experiment with the Cooper engine was in 1830, as it was the year I entered the Baltimore and Ohio Railroad Company's service, and some of the particulars are permanently fixed upon my memory.

"I cannot add more just now, and, as I shall not be in Baltimore for three or four weeks, I must delay writing.

"Respectfully and truly yours,

"Benj. H. Latrobe."

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In 1829 Mr. Cooper made some experiments with his little locomotive, built upon the principle he first adopted; but, as it did not perform as well as he expected and desired, he changed his plan, and, after some delays, made, as one may say, the first actual experimental trip on Saturday, August 28, 1830. A full and particular account of this experiment has been given the author by Mr. Winans himself, who was present on the occasion, and took a lively interest in the result. Mr. Winans writes:

"On Saturday, the 28th of August last, 1830, the first railroad-car propelled by steam proceeded the whole distance from Baltimore to Ellicott's Mills, and tested a most important principle—that curvatures of 400 feet radius offer no material impediment to the use of steam-power on railroads, when the wheels are constructed with a cone, on the principle ascertained by Mr. Knight, chief engineer of the Baltimore and Ohio Railroad Company, to be applicable to such curvatures. The engineers in England have been so decidedly of opinion that locomotive steam-engines could not be used on curved rails, that it was much doubted whether the many curvatures on the Baltimore and Ohio Railroad would not exclude the use of steam-power. We congratulate our fellow-citizens on the conclusive proof, which removes forever all doubt on this subject, and establishes the fact that steam-power may be used on our road with as much facility and effect as that of horses, at a very reduced expense.

"The engine" (Cooper's locomotive-engine) "started from Pratt Street depot, taking the lead of a train of carriages. The power of the engine is a little, if any, over that of one horse, and it can therefore only be regarded as a working model. Immediately on front of, and connected with it, was a passenger-carriage containing (including the engine attendants) twenty-four persons. The aggregate weight of carriages, persons, fuel, and water, as nearly as could be ascertained, was estimated to be from four to four and a half tons. Notwithstanding the great disproportion of the moving power to the load, the following highly-gratifying results were obtained; the time was accurately noted by disinterested gentlemen, of the first respectability:

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First mile—performed in six minutes and fifty seconds, the steam in the onset not being fully raised.

Second mile—performed in five minutes; one minute was lost in altering the switch, to pass from one track to the other.

Third mile—travelled in six minutes; two minutes lost in changing from one track to the other, the switch not being in the right place.

Fourth mile—was travelled in four minutes and thirty seconds.

Fifth mile—occupied five minutes and twenty-five seconds.

Sixth mile—travelled in six minutes; one minute was lost in changing to the other track.

Seventh mile—travelled in five minutes and thirty seconds; the engine stoped at the middle depot for fifteen minutes to receive a supply of water.

Eighth mile—performed in six minutes.

Ninth mile—performed in five minutes and forty-five seconds, the engine traversing an ascent of thirteen feet per mile, and encountering the numerous curves which abound in this part of the road.

Tenth mile—performed in seven minutes; the engine still ascending at the rate of thirteen feet per mile, and the road much curved.

Eleventh mile—in seven minutes and thirty seconds; the same disadvantages of an ascending and curved line of road being still encountered.

Twelfth mile—in seven minutes and thirty seconds; the ascent here being increased to eighteen feet per mile and the line curved.

Thirteenth mile—in six minutes and thirty seconds, the same disadvantages of an ascending and curved line being encountered as on the preceding mile.

"Making the aggregate passage of thirteen miles, under the circumstances detailed, in the space of one hour and fifteen minutes.

"On the return of the locomotive-engine at six o'clock in the evening, the following results were realized, there being four additional passengers, or thirty in all, seated in the attached carriage:

First mile—travelled in five minutes.

Second mile—travelled in four minutes.

Third mile—travelled in four minutes six seconds.

Fourth mile—travelled in four minutes.

Fifth mile—travelled in four minutes four seconds.

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Sixth mile—travelled in four minutes five seconds.
(Four minutes occupied in taking in a supply of water.)
Seventh mile—travelled in five minutes.
Eighth mile—travelled in three minutes fifty seconds.
Ninth mile—travelled in four minutes twenty-five seconds.
Tenth mile—travelled in four minutes ten seconds.
Eleventh mile—travelled in four minutes forty seconds.
Twelfth mile—travelled in four minutes fifty seconds.
Thirteenth mile—travelled in four minutes fifty seconds.

Making the entire passage of thirteen miles in sixty-one minutes, including the four minutes lost in taking in water at the middle depot. If this be deducted, it will give precisely fifty-seven minutes in travelling the distance.

"It should also be borne in mind that these are experiments merely, and that several material improvements have already suggested themselves to the inventor. The result, under all the circumstances, is highly satisfactory, and constitutes another triumph of the efforts of American genius."

CHAPTER XXII.

ROSS WINANS'S COMPARISONS.

We will also take pleasure here in laying before our readers the following highly-interesting letter from Ross Winans, Esq., the inventor of the friction-wheels now in general use on the Baltimore and Ohio Railroad. It gives a comparative view of the performance of the locomotive-engine of the Messrs. Stephenson, of England, contrasted with that of Mr. Cooper:

Baltimore, *August* 28, 1830.

Philip E. Thomas, Esq., *President Baltimore and Ohio Railroad Company*—

"Sir: The performance of the working model of experimental locomotive-engine of Mr. Cooper has been such to-day as to induce

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me to attempt a hasty comparison of its dimensions and performances with some of the late celebrated English locomotives, having witnessed the grand locomotive exhibition at Liverpool in October last, for the £500 purse, and many other interesting experiments by the Novelty and Rocket since that time. As Mr. Cooper's engine has been got up in a temporary manner, and for experiment only, and has been on the road but a few days, it will be no more than justice to make the comparison with some of the early experiments of the English engines. I have, therefore, selected the experiment of the Rocket in October, on the result of which the premium of £500 was awarded to Mr. Stephenson, its builder, for having produced the most efficient locomotive-engine, etc.

"The Rocket is professedly an eight horse-power when working at a moderate speed, but, when working at high velocities, she is said to be more than eight horse-power. Its furnace is two feet wide by three feet high; the boiler is six feet long and three feet in diameter.

"The furnace is outside of the main boiler, and has an external casing, between which and the fireplace there is a space of three inches filled with water and communicating with the boiler. The heated air from the furnace is circulated through the boiler by means of twenty-five pipes of two inches internal diameter. It has two working cylinders of eight inches internal diameter and fifteen inches in length each, or thereabouts. The road-wheels to which the motion is communicated are four feet eight and a half inches in diameter. Mr. Cooper's engine has but one working cylinder of three and one-fourth inches diameter, and fourteen and a half inch stroke of piston, with a boiler proportionably small, or nearly so. The wheels of the engine to which the motion is communicated are two and a half feet in diameter, making it necessary to gear with wheel and pinion to get speed, by which means a considerable consumption of power is experienced. You will perceive by the foregoing that the capacity, or number of cubic inches, contained in the cylinder of Mr. Cooper's engine is only about one-fourteenth part of that contained in the two cylinders of the Rocket; consequently, it can only use one-fourteenth the quantity of steam under the same pressure when each engine is making the same number of strokes per minute, which is nearly the case when the two engines are going at equal speed on the road. The total weight moved in the experiment above alluded to by the Rocket,

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including her own weight, was seventeen tons on the level road at an average speed of twelve and a half miles the hour, thereby exhibiting (agreeably to Vignoles's late table of the power of locomotive-engines) a little less than a six-horse engine.

"Mr. Cooper's engine has to-day moved a gross weight of four and a half tons from the depot to Ellicott's Mills and back in the space of two hours and ten minutes, which, as you are aware, the distance being twenty-six miles, gives an average speed of twelve miles to the hour. As the engine returned with its load to the same point whence it started, the acclivities and declivities of the road were, of course, balanced; and at least as much time and power (if not more) were required to traverse the whole distance as would have been on a level road; therefore (agreeably to the aforesaid tables of M. Vignoles) Mr. Cooper's engine exhibited an average force during the time it was running of 1.43 horse power, or nearly one and a half, which is more than three times as much power as the Rocket exhibited during the experiment above described, in proportion to the cylindrical capacity of the respective engines. This, no doubt, originated in a considerable degree from the steam being used in Mr. Cooper's engine at a higher pressure than in the Rocket. We are, however, not able to come to any very correct conclusion as to what extent this cause prevailed (Mr. Cooper's steam-gauge not being accurately weighed), which prevents a more minute comparison being made. It may be said that subsequent practice and experience with the Rocket have enabled her constructor to produce more favorable results, which is no doubt the case; but we have every reason to expect a similar effect with regard to Mr. Cooper's engine, judging from what we have witnessed, each exhibition of its power being, as yet, an improvement upon the one that preceded it. It is, however, too small and too temporary in its construction to expect a great deal, from the friction of the parts; the heat lost in a small engine being much greater in proportion to the power than in a large one. But to-day's experiments must, I think, establish, beyond a doubt, the practicability of using locomotive steam-power on the Baltimore and Ohio Railroad for the conveyance of passengers and goods at such speed and with such safety (when compared with other modes) as will be perfectly satisfactory to all parties concerned, and with such economy as must be highly flattering to the interests of the company. It has been doubted by many whether the unavoidable numerous short curves

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on the line of your road and inclined planes would not render the use of locomotive-power impracticable; but the velocity with which we have been propelled to-day by steam-power round some of the shortest curves (to wit, from fifteen to eighteen miles per hour) without the slightest appearance of danger, and with very little, if any, increased resistance, as there was no appreciable falling off in the rate of speed, and the slight diminution in speed in passing up the inclined planes, some of which were nearly twenty feet to the mile, must, I think, put an end to such doubts, and at once show the capability of the Baltimore and Ohio Railroad to do much more than was at first anticipated or promised by its projectors and supporters.

"Very respectfully,

"Ross Winans."

As much as we have written and quoted respecting this first experimental locomotive of Mr. Peter Cooper, we still cannot leave the subject without giving our readers a description of that first trip, from the pen of H. B. Latrobe, Esq., the counsellor of the company, who was one of the passengers on that occasion. In a lecture before the Maryland Institute, in 1868, Mr. Latrobe, after speaking of the numerous curves that existed on the line of the Baltimore and Ohio Railroad, thus continues:

"For a brief season it was believed that this feature of the early American roads would prevent the use of locomotive-engines. The contrary was demonstrated by a gentleman still living in an active and ripe old age, honored and beloved, distinguished for his private worth and for his public benefactions; one of those to whom wealth seems to have been granted by Providence that men might know how wealth might be used to benefit one's fellow-creatures. The speaker refers to Mr. Peter Cooper, of New York. Mr. Cooper was satisfied that steam might be adapted to the curved roads which he saw would be built in the United States; and he came to Baltimore, which then possessed the only one on which he could experiment to vindicate his belief, and he built an engine to demonstrate his belief. The machine was not

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larger than the hand-cars used by workmen to transfer themselves from place to place; and, as the speaker now recalls its appearance, the only wonder is, that so apparently insignificant a contrivance could ever have been regarded as competent to the smallest results. But Mr. Cooper was wiser than many of the wisest around him. His engine could not have weighed a ton, but he saw in it a principle which the forty-ton engines of to-day have but served to develop and demonstrate.

"The boiler of Mr. Cooper's engine was not as large as the kitchen boiler attached to many a range in modern mansions; it was of about the same diameter, but not much more than half as high. It stood upright in the car, and was filled above the furnace, which occupied the lower section, with vertical tubes. The cylinder was but three and a half inches in diameter, and speed was gotten up by gearing. No natural draught could have been sufficient to keep up steam in so small a boiler; and Mr. Cooper used, therefore, a blowing-aparatus, driven by a drum attached to one of the car-wheels, over which passed a cord that in its turn worked a pulley on the shaft of the blower. Among the first buildings erected at Mount Clare was a large car-house, in which railroad-tracks were laid at right angles with the road-track, communicating with the latter by a turn-table, a liliputian affair indeed compared with the revolving platforms, its successors, now in use.

"In this car-shop, Mr. Cooper had his engine, and here steam was first raised; and it seems as though it were within the last week that the speaker saw Mr. George Brown, the treasurer of the company, one of our most estimable citizens, his father Mr. Alexander Brown, Mr. Philip E. Thomas, and one or two more, watch Mr. Cooper, as with his own hands he opened the throttle, admitted the steam into the cylinder, and saw the crank-substitute operate successfully with a clacking noise, while the machine moved slowly forward with some of the by-standers, who had stepped upon it. And this was the first locomotive for railroad purposes ever built in America; and this was the first transportation of persons by steam that had ever taken place on this side of the Atlantic, on an American-built locomotive.

"Mr. Cooper's success was such as to induce him to try a trip to Ellicott's Mills, on which occasion an open car, the first used upon the road already mentioned, having been attached to the engine, and filled with the directors and some friends, the speaker

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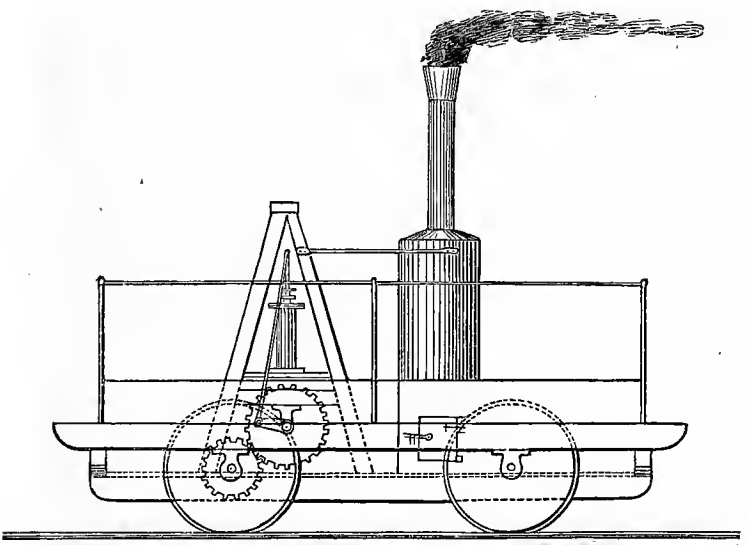
among the rest, the first journey by steam in America on an American locomotive was commenced. The trip was most interesting. The curves were passed without difficulty, at a speed of fifteen miles an hour; the grades were ascended with comparative ease; the day was fine, the company in the highest spirits, and some excited gentlemen of the party pulled out memorandum-books, and when at the highest speed, which was eighteen miles an hour, wrote their names and some connected sentences, to prove that even at that great velocity it was possible to do so. The return-trip from the Mills, a distance of thirteen miles, was made in fifty-seven

FIG. 9.



A SIDE VIEW OF PETER COOPER'S LOCOMOTIVE, THE "TOM THUMB."

[From an original drawing expressly for this work.]

minutes. This was in the summer of 1830, but the triumph of this Tom Thumb engine was not altogether without a drawback. The great stage proprietors of the day were Stockton and Stokes; and on that occasion a gallant gray, of great beauty and power, was driven by them from town, attached to another car on the second track—for the company had begun by making two tracks to the Mills—and met the engine at the Relay House, on its way back.

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From this point it was determined to have a race home; and, the start being even, away went horse and engine, the snort of the one and the puff of the other keeping time and time.

"At first the gray had the best of it, for his *steam* would be applied to the greatest advantage on the instant, while the engine had to wait until the rotation of the wheels set the blower to work. The horse was perhaps a quarter of a mile ahead, when the safety-valve of the engine lifted, and the thin blue vapor issuing from it showed an excess of steam. The blower whistled, the steam blew off in vapory clouds, the pace increased, the passengers shouted, the engine gained on the horse, soon it lapped him—the silk was placed—the race was neck and neck, nose and nose—then the engine passed the horse, and a great hurrah hailed the victory. But it was not repeated, for just at this time, when the gray master was about giving up, the band which drove the pulley, which moved the blower, slipped from the drum, the safety-valve ceased to scream, and the engine, for want of breath, began to wheeze and pant. In vain Mr. Cooper, who was his own engineer and fireman, lacerated his hands in attempting to replace the band upon the wheel; in vain he tried to urge the fire with light wood: the horse gained on the machine and passed it, and, although the band was presently replaced, and steam again did its best, the horse was too far ahead to be overtaken, and came in the winner of the race. But the real victory was with Mr. Cooper, notwithstanding. He had held fast to the faith that was in him, and had demonstrated its truth beyond peradventure. All honor to his name! In a patent-case, tried many years afterward, the boiler of Mr. Cooper's engine became, in some connection which has been forgotten, important as a piece of evidence. It was hunted for and found among some old rubbish at Mount Clair. It was difficult to imagine that it had ever generated steam enough to drive a coffee-mill, much less that it had performed the feats here narrated. In the *Musée d'Artillerie* at Paris there are preserved old cannon, contemporary, almost, with Crecy and Poictiers. In some great museum of internal improvement, and some such will at a future day be gotten up, Mr. Peter Cooper's boiler should hold an equally prominent and far more honored place; for while the old weapons of destruction were ministers of man's wrath, the contrivance we have described was one of the most potential instruments in making available, in America, that vast system which unites remote people, and promotes that peace on earth and good-will to men which angels have proclaimed."

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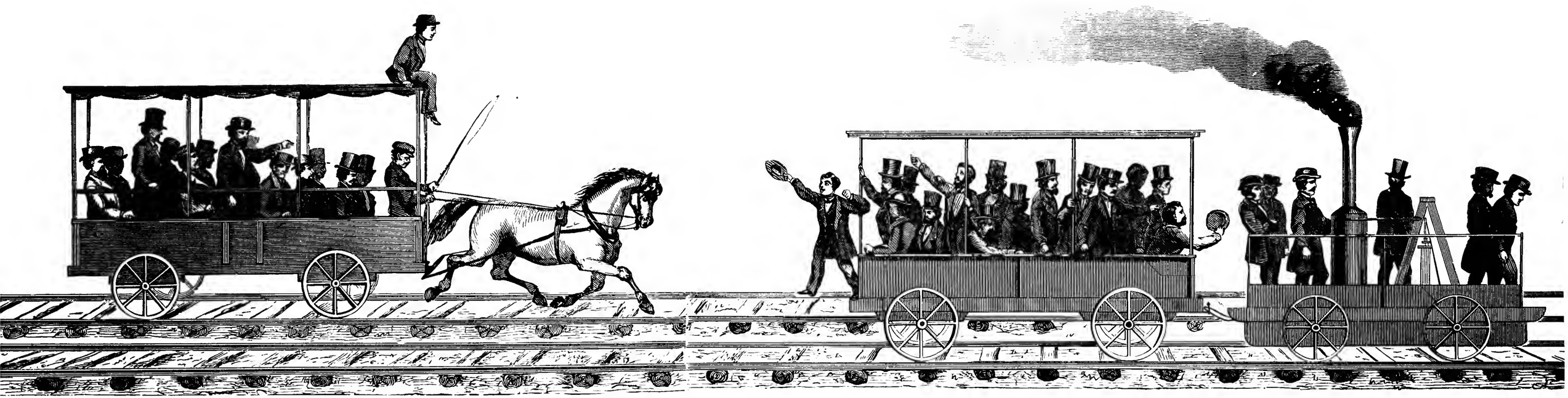
Exciting Trial of Speed between Mr. Peter Cooper's Locomotive, "Tom Thumb" and one of Stockton & Stokes' Horse-Cars.



The trial took place on the Baltimore and Ohio Rail-Road, on the 28th August, 1830. The sketch represents the moment the Engine overtook and passed the Horse-Car, the passengers filled with excitement.

See Mr. Latrobe's description, page 119.

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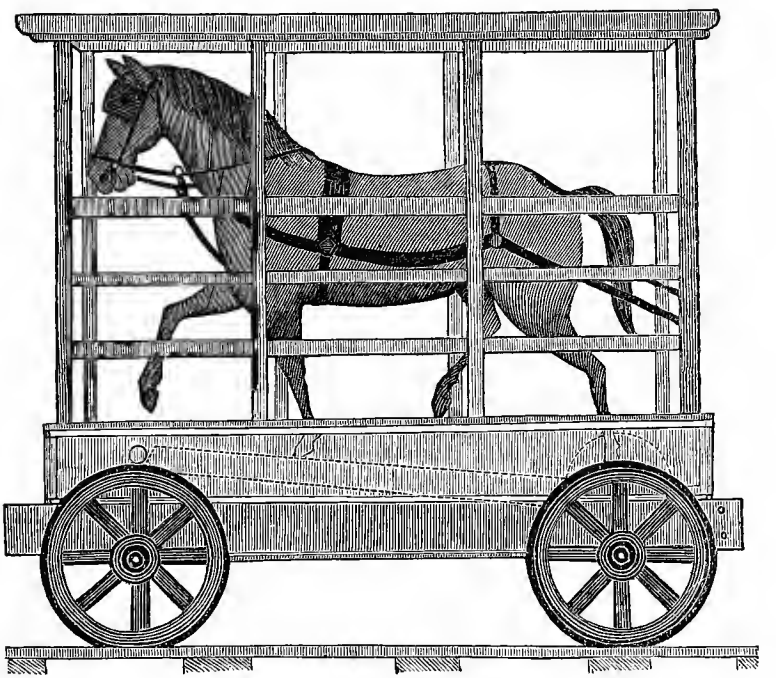
CHAPTER XXIII.

HORSE AND SAILING CARS.

As we stated in a previous page, a competitor that steam had to contend with on the Baltimore and Ohio Railroad was "horse-power." A horse was placed in a car and made to walk on an endless apron or belt,

FIG. 10.



HORSE-POWER LOCOMOTIVE.

and to communicate motion to the wheels, as in the horse-power machines of the present day. The machine worked indifferently well; but, on one occasion, when

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drawing a car filled with editors and other representatives of the press, it ran into a cow, and the passengers, having been tilted out and rolled down an embankment, were naturally enough unanimous in condemning the contrivance. And so the horse-power car, after countless bad jokes had been perpetrated on the cowed editors, passed out of existence, and probably out of mind.

Following the horse-power car came the Meteor. This was a sailing-vehicle, the invention of Mr. Evan Thomas, who was, perhaps, the first person, as already mentioned, who advocated railroads in Baltimore. The Meteor required a good gale to drive it, and would only run when the wind was what sailors call abaft, or on the quarter. Head-winds were fatal to it, and Mr. Thomas was afraid to trust a strong side-wind lest the vehicle might be upset; so it rarely made its appearance except a northwester was blowing, when it would be dragged out to the farther end of the Mount Clair embankment, and come back, literally with flying colors. The Baltimore and Ohio Railroad being the first in operation in this country, and almost the first in the world for the transportation of passengers and merchandise, of course was visited by crowds from almost every section of the United States, as well as from parts of Europe. Among them was Baron Krudener, envoy from Russia, who, by invitation of Mr. Thomas, made an excursion in the sailing-car, managing the sail himself. On his return from the trip, he declared he had never before travelled so agreeably. Mr. Thomas caused a model sailing-car to be constructed, which he presented to the baron, with the respects of the company, to be forwarded to the emperor. This courtesy on the part of Mr. Thomas was handsomely acknowledged by the baron.

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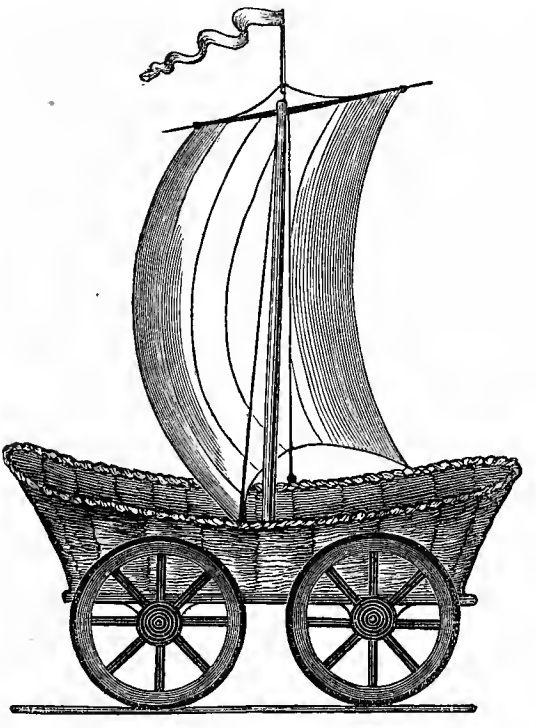
Like the horse-car, the sailing-car had its day. It was an amusing toy—nothing more—and is referred to now as an illustration of the crudity of the ideas prevailing forty years ago in reference to railroads.

FIG. 11.



SAILING-CAR.

It was after the demonstration by Peter Cooper that the Baltimore and Susquehanna Railroad Company, now the Northern Central, imported the Herald from England. It ran off the track continually, and was useless. Its unfitness, with its large wheels, for use on our curved roads was at once apparent, and it had to be altered to obviate the difficulty. It was, however,

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antedated by the engine of Mr. Cooper and other locomotives, as we shall show; yet it excited great admiration for its beauty, and even its driver, an Englishman named John, became a person of consequence. When he came down from the engine to oil it, the crowd surrounded him, as the boys at a race surround the dismounted jockeys on the course. The whole American world were railroad children in the days we speak of.

The contest for the right of way along the Potomac between the Baltimore and Ohio Railroad and the Chesapeake and Ohio Canal Companies—the preliminary proceedings, in which counsel on both sides, with surveyors at their heels like moss-troopers, scouted the banks of the river from the Point of Rocks to Williamsport, ferreted out the proprietors of almost inaccessible cliffs, besieged them in their dwellings to obtain grants of the right of way, described what railroads were, oftentimes to men whose knowledge of highways was confined to mountain-paths, made diagrams and drawings of cars and tracks unlike any thing that ever existed before or which ever came afterward, and were believed by an ignorance that was only greater than their own—these proceedings alone would furnish more than a dozen chapters, but our limits will not allow us to record them. The route to the mountains lay up the valley of the Potomac, and the struggle for priority of claim was a prolonged and exciting one.

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PETER COOPER.

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CHAPTER XXIV.

PETER COOPER.

Mr. Peter Cooper, of New York, like his great contemporary, George Stephenson, of England, may be justly looked upon as the pioneer of the locomotive system in America. Undoubtedly he built the first locomotive ever constructed here; and although (as we have stated before) his little machine was not intended for practical purposes or employment upon a railroad, yet it was designed to demonstrate a fact then very much doubted, namely, the ability of a locomotive to travel on the short-curved roads in this country, which Mr. Cooper's successful performance set at rest forever. But the Herald was antedated in another quarter. Mr. Cooper commenced his career in life from the very foot of the ladder, and, like him also, by his indomitable perseverance and industry, clambered step by step from one round to another, ascending until he reached the proud pinnacle of the topmost round, as a pioneer in the great achievements of the locomotive, now an indispensable necessity for the successful prosecution of trade and commerce throughout the world.

From New York Evening Mail, July 1, 1869.

"The history of a poor boy, without education or influential friends, who, by honesty, industry, and persistence, raised himself to a position of wealth and reputation, cannot but be interesting. Such, if properly told, would be the life of Peter Cooper—a man who, perhaps, as much as any other citizen of New York, has left his mark on his associates, and has placed his name in imperishable remembrance.

"He was born in the city of New York, February 12, 1791. His

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maternal grandfather, John Campbell, was Mayor of New York, and deputy quartermaster-general during the Revolutionary War, in which his father also served as a lieutenant. Mr. Cooper's father was a respectable hatter, and, as soon as young Cooper was old enough to pick fur from the rabbit-skins used in making hats, he was set to work. He had no opportunities for education, and only attended school one or two months in his life. 'I have never had any time to get an education,' he once almost pathetically remarked, 'and all that I know I have had to pick up as I went along.'

"He remained in the hat business with his father until he had mastered it in all its branches, and during much of the time, after he had finished his labors for the day, he would work until late at night with some carver's tools which his grandmother gave him, in order to eke out his small wages.

"We, who go to our places of business at nine, or less, and leave at five, can little realize the toil which falls to the lot of mechanics. The Cooper Institute is the result of the recollections of those early days, and was intended to help poor boys in the same situation as he had been. Young Cooper afterward went into the brewing business, at which he remained about two years. He then served the usual apprenticeship to coach-making, and finally went into the cloth-shearing business with his brother. For some time he succeeded very well, but after the War of 1812 his business was so injured by the introduction of foreign cloths that he left it and began cabinet-making. He gave this up after a while, and opened a grocery-store on the present site of the Cooper Union, where he carried on a small retail trade for some time. He finally bought a woollen factory with his savings, and since that time has steadily prospered. He has since tried his hand at other kinds of business, but the largest part of his fortune was gained by the manufacture of glue and by his iron-works. He has shown a Yankee talent for undertaking different speculations, as well as great shrewdness and prudence in conducting them.

"In 1830 he erected extensive iron-works at Canton, near Baltimore, where he built from his own designs the first locomotive ever turned out on this continent. He carried on large wire and rolling mills at Trenton, New Jersey, and was the first person to roll wrought-iron beams for fire-proof buildings. He has been much interested in the progress of telegraphy, and has been an officer in several leading telegraph associations.

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"It was while serving as an alderman, forty years ago, that Mr. Cooper conceived the idea of the 'Cooper Union.' A fellow-officer who had visited the *Écoles d'Industrie*, in Paris, and been much impressed with their utility and attractions, described them to him and suggested that they would be well suited for introduction into this country. The thought thus planted in Mr. Cooper's mind, remained for long years, germinated, took root, and grew into the accomplishment of his design.

"Let those who think it an easy thing to do good, ponder the lesson taught by Mr. Cooper's experience in building the Institute. The mere saving and donating the money for the purpose was but a fraction of the work performed. Great difficulties had to be overcome in designing so unique a building. Mr. Cooper was determined that it should be fire-proof, consequently a separate foundery had to be erected to forge the iron used in the construction; when this was done, the estimated outlay fell short twenty-five thousand dollars of the actual cost. Countless other obstacles had to be overcome, and finally the Institute was completed, at an immense cost over its estimated expense. In fact, it took all Mr. Cooper's money to finish it, and he was comparatively a poor man when all the bills were paid; but, as if to reward his sacrifices, his business has since improved, until he is now richer than ever.

"What greater triumph could be desired, than to have accomplished such a work as the Institute as it now stands, with its classes for young men and women, its scientific, literary, art, and music schools, reading-room, and other features, and what greater honor could be desired than to go down to posterity as its founder? Let the voices of those who have received its benefits be a pæan to the memory of its originator, and let his name share the glory of their deeds!

"But nothing is complete in life without its disagreeable side, and noble as have been Mr. Cooper's motives, and open as were his plans in erecting this institution, not a few persons have avowed their belief that it was all done with self-interested views.

"After this, who can expect gratitude from the world?

"Mr. Cooper's personal appearance is familiar to every New-Yorker. He is of middle stature, with silver locks and beard, and a venerable and benevolent face. He is best known by his old white hat, which, like Horace Greeley's, is characteristic of the man. He commonly drives about in an old-fashioned one-horse chaise, drawn by a steady mare, the whole turn-out looking as if

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it belonged to some well-to-do farmer or retired tradesman, rather than a millionnaire.

"The key to Mr. Cooper's life and deeds is to be found in those few words which we have heard from his own lips: 'I resolved that I would repay every benefit which I had received by conferring an equal benefit on some of my fellow-men.'

"His success in business has been greatly due to a faculty for taking up enterprises which had been abandoned by other people, and by dint of perseverance and hard work making them succeed. In the main, however, he has gained his ends by attending to his affairs in person, and has always strictly followed Dr. Franklin's principle—'The eye of the master is worth all of his servants.' Even at his present advanced age he does not neglect this rule, but keeps a strict eye upon the affairs of the Cooper Union."

We cannot leave Mr. Cooper, even now, without devoting a few pages of our work to record his last act of generosity, benevolence, and philanthropy, toward the meritorious poor and industrious classes of our community, in his munificent bequest of one hundred and fifty thousand dollars to be used in the establishment and endowment of a library, where the hard-working and deserving classes, who desire repose and relaxation after the toils of the day, can seek recreation and information from the great store of useful books he has placed within their reach, where all may participate who feel a desire of so doing, and know that they are welcome.

On the day of this munificent bequest, Mr. Cooper reached his eightieth birthday, February 12, 1871. On that occasion a most interesting interview took place between the graduating class of the Institute and their venerable benefactor and friend. We trust that our readers, many of whom no doubt will be found among the mechanics and working-classes of the community, will not deem it out of place here to record the doings on that most interesting occasion.

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The class, together with a large number of citizens being present in the hall of the Institute, the following address from the graduates was made to Mr. Cooper.

CHAPTER XXV.

ADDRESS OF THE GRADUATES.

PETER COOPER, ESQ.—

"SIR: The graduates and students of the Cooper Union gratefully desire to commemorate both the eightieth anniversary of your birth, celebrated February 12, 1871, and the gifts whereby you made the day memorable.

"They have, therefore, selected this occasion as most appropriate, to present to you the following address:

"*Honored Founder and President:*

"We tender you our earnest congratulations that, in the providence of Almighty God, your life has been prolonged beyond the ripe age of fourscore years; and that you retain that vigor of body, strength of mind, and warmth of heart, which promise to you many years of usefulness and honor.

"Your history presents a rounded and complete record: as a mechanic, distinguished for rare ingenuity and versatility; as a merchant, famous for sagacity, enterprise, and uprightness; as a patriot, passing beyond the bounds of section and party, to sustain public measures that embrace the permanent welfare of the whole country.

"In any land or age these attributes alone should commend you to the respect and admiration of your fellow-citizens. How eminently, then, are these qualities enhanced by your munificence as a philanthropist!

"Keenly appreciating the great importance of practical scientific knowledge to the industrial masses, you determined to place such advantages within their reach, through a project conceived in youth, cherished through thrifty manhood, and consummated in

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the mellowness of age. At that period in life when men enter reluctantly upon untried schemes, and when they cling most tenaciously to their possessions, you generously consecrated the bulk of the fortune you had been patiently accumulating for half a century, to found the Cooper Union for the Advancement of Science and Art —an institution that in the present and all after-time shall stand as a working-man's legacy to his countrymen, at once 'royal in magnitude and beneficent in design.'

"The grand and solid success which has attended it in the past will be vastly strengthened and extended in the future, by the crowning act of your life—your noble birthday offering of one hundred and fifty thousand dollars, to establish, in connection with the institution, a valuable reference and lending library.

"Henceforth, through its School of Design, its School of Science and Art, its reading-room, library, lectures, and laboratories, it will be the radiating centre of mighty forces, from which, year after year, as they deepen their channels and widen their sweep, will proceed influences which can never be fully estimated.

"But among the substantial results will be the advancement and diffusion of that larger culture of hand, and head, and heart, that moulds the skilled artisan and upright, intelligent citizen, without whom our country need hope for no broad and thorough development of its boundless resources, nor elevation and permanency to its free institutions.

"The mission of the Cooper Union comprehends more than this. It has lessons for the rich as well as for those in the humblest ranks of life. Rising here in the midst of the metropolis of a continent, it is an 'everlasting protest' against the avarice and ambition which rear overshadowing fortunes for mere personal gratification. It teaches such how they may become the 'masters and not the slaves' of their wealth; how they may render it an imperishable memorial of their love, and a perpetual source of public good; so that when they shall be seen no more forever in the walks of men, they shall live on, through their benefactions, in the embalming love and gratitude of mankind.

"As past and present students, we welcome this opportunity to express, however inadequately, still publicly and collectively, our profound appreciation of our obligations to you. We fervently thank you, not only for the precious educational facilities you have provided for us, but also for the ennobling example of a long life,

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extending through either extreme of fortune, yet marred by no vices and enshrouded by no dishonor.

"Prepared through that knowledge, and inspired by that example, may each of us, and those who shall throng these halls after us, pass through life, animated by deeper love of country, broader sympathies for man, and loftier allegiance to God!

"In conclusion, sir, we can but renew our gratulations that you have been spared to see the day that completes, under such promising auspices, the twelfth annual commencement of an institution that long years ago rose before your vision in distant and shadowy outlines; that you have lived in a period without parallel in the annals of time, for that wonderful progress in the industrial arts and physical sciences which heralds the dawn of a brighter era for the toiling millions; and that you have labored so devotedly and effectually for its realization.

"A career, so permanently useful and illustrious, is the prelude to a fame neither transient nor uncertain. While virtue, patriotism, and philanthropy, are honored on earth and recorded in heaven, your deeds shall not drop from the memory nor your name fade from the lips of men. In love and gratitude they shall evermore dedicate to you an exalted station in the Pantheon where, from every age and clime, are enshrined in holy keeping that royal brotherhood, the benefactors of humanity."

To this Mr. Cooper replied:

"My Young Friends: If I needed any reward for my humble efforts to benefit my fellow-men, the touching language of your address, and this expression of your affection and gratitude, would be ample compensation for labors however exacting and sacrifices however great. Happily, however, works of benevolence carry with them their own recompense, even though they do not meet with the recognition which has fallen to my lot, and which makes me feel that this occasion is the crowning happiness of a life which has passed the eightieth anniversary.

"In that long experience I have learned lessons which, if I could induce you, my young friends, who have your future before you, and others who have left their past behind them, to lay them to heart, and to practise in the conduct of life, would greatly lessen the evils of society and improve the condition of the land and the time in which we live. While yet a child, I learned that the

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'hand of the diligent maketh rich,' and whatever of wealth I had achieved has been due, primarily, to habits of patient industry formed at the outset of my career. I soon learned that 'waste-makers want,' and I therefore saved what I earned; and, by taking 'stitches in time,' guarded against the loss which unavoidably attends upon neglect and want of foresight. It did not take long for me to learn that drunkenness was the parent of the larger portion of the poverty, vice, and, crime which afflict the American people; and hence, until advancing age seemed to demand moderate stimulants, I carefully avoided alcoholic liquors as the greatest curse of the young, and the most deadly foe to domestic happiness and the public welfare.

"Next, I observed that most of the shipwrecks in life were due to debts hastily contracted, and out of proportion to the means of the debtor, and hence I always avoided debt, and endeavored to keep some ready money on hand to avail of a favorable opportunity for its profitable use. With economy and industry, it is easy to do this in this favored land; and in my case the result has been that, amid all the financial revolutions through which I have passed, no obligation of mine has ever been a day in arrear. Debt is a slavery which every young man ought to avoid, or, if assumed, ought not to endure for one day beyond the shortest time necessary to set him free. Shunning intemperance and debt, and practising industry, rigid economy, and self-denial, it was easy to be honest, and to acquire such knowledge as the opportunities of this city offered in the days of my youth. But these opportunities were so limited—there being no free schools by day, nor any night-schools whatever—that I found it far more difficult to learn what I wanted to know, than to be industrious, temperate, and prudent. Hence, I decided, if I should prosper in the acquisition of worldly means, to found an institution to which all young people of the working-classes, who desired to be good citizens and to rise in life, could resort without money and without price, in order to acquire that knowledge of their business and science which, in these days, is absolutely indispensable to a successful career. Providence, in accordance with the declaration that to 'faith all things are possible,' did bless my efforts; and this institution, and these encouraging evidences of its value and its fruits presented here to-night, is the result of this resolution, never lost sight of during a business career of nearly sixty years, in which I was cheered, comforted, sustained, and encouraged by the greatest

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of human blessings—a diligent, wise, industrious, faithful, and affectionate wife; and in the work of founding this institution, aided by the earnest sympathy and active coöperation of my children, who justly regarded as the richest portion of their inheritance that part of my wealth which I desired to consecrate to the public welfare. Hence, my last lesson for the young is to marry at the proper age, when, *and not before*, they can see the way clear to a decent and comfortable support, and thus fulfil the first law of Nature with a high and holy sense of its happiness and its duties, the greatest and most serious in the path of life. *Love and duty* I have ever found to be the passwords of all that is true and noble in life, and, when they are separated, the fires on the family altar die out, and life loses all its charms, never to be compensated by the false jewels which are often worn in the public gaze.

"These are, indeed, simple truths, which I have endeavored to set forth in words equally simple, because I feel sure from a very long experience that they will do good to every young man and young woman who will firmly resolve to make them the rule of life, and because I began life without means, and know the truth of what I affirm.

"But, having also acquired what is regarded as riches, have I earned the right, by the use I have made of them, to give any advice or speak a word of encouragement to others, who, by the will of God, are intrusted with the great responsibility of wealth? Whether I have this right or not, I feel impelled to record my conviction, derived from personal experience, that the rich man who regards his wealth as a sacred trust, to be used for the welfare of his fellow-men, will assuredly derive more true enjoyment from it in this world than from the most lavish expenditure on mere personal enjoyments and social display. I do not pretend to prescribe any standard of expenditure for others; and I am quite ready to subscribe to the doctrine that a just and faithful trustee should be liberally paid for his services, and should not be restricted in the reasonable gratification of his desires, so long as the rights of others are not thereby infringed; and I desire to give the fullest recognition to the sacredness of private property, and the conservation of capital, as for the best interests of society and all the members thereof. But I cannot shut my eyes to the fact that the production of wealth is not the work of any one man, and the acquisition of great fortunes

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is not possible without the coöperation of multitudes of men; and that, therefore, the individuals to whose lot these fortunes fall, whether by inheritance or the laws of production and trade, should never lose sight of the fact that, as they hold them only by the will of society, expressed in statute law, so they should administer them as trustees for the benefit of society, as inculcated by the moral law.

"When rich men are thus brought to regard themselves as trustees, and poor men learn to be industrious, economical, temperate, self-denying, and diligent in the acquisition of knowledge, then the deplorable strife between capital and labor, tending to destroy their fundamental, necessary, and irrefragable harmony, will cease; and the world will be no longer afflicted with such unnatural industrial conflicts as we have seen during the past century in every quarter of the civilized globe, and latterly on so great a scale in this country, arraying those whom Nature intended to be firm allies and inseparable friends into hostile camps, in which the great law of love and mutual forbearance is extinguished by selfish passions.

"The law of force, whether expressed in trade associations, preventing other men from exercising their inalienable right to labor where they can find work, or in combinations of capitalists, seeking by lock-outs to close up the avenues of labor, are equally reprehensible, and should never be allowed, under any provocation whatever, to take the place of the Divine law, 'Whatsoever ye would that men should do unto you, do ye even so unto them;' nor will such an unnatural and criminal substitution ever be possible, if poor men will remember that it is the duty, and therefore the right, of every poor man to strive to become rich by honest, intelligent, and patient labor; and if rich men will remember that the possession of wealth, which is the fruit of the general effort, confers no right to its use, as an engine of oppression or coercion, upon any class which is concerned in its production. Let me, then, record that, during a long life passed in active business, I have never known any but evil consequences to all classes, and especially to the innocent, to result from strikes, lock-outs, or other forcible measures, designed to interfere with the steady and regular march of productive industry; and I feel justified in an earnest appeal to both workmen and capitalists, henceforth, to regard each other as equals and friends; and to imitate the great example, so recently set by the enlightened Governments of Great

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Britain and the United States, in the submission of their differences to arbitration; and not to expect to reform social evils by combinations designed to force either side into the acceptance of unpalatable terms by the stern logic of starvation and indiscriminate ruin.

"Reform, to be of any permanent value, must be based upon personal virtue, not force; and it seems to me that the millennium will not be far off when each individual shall set about reforming himself, rather than society, and conforming his life to the great law of loving God and his fellow-man.

"While I thank you again, my young friends (I had almost said my children), for this manifestation of your respect and gratitude, so touching because so full of love, let me ask you to accept of this feeble but heart-felt reply, as a kind of last will and testament of the garnered experience of an old friend, whose days are almost numbered, and who asks only to be remembered as 'one who loved his fellow-men.'"

CHAPTER XXVI.

PRIZE FOR BEST LOCOMOTIVE.

We will now resume our history of the early locomotives in America, believing that our readers will pardon our digression.

As it may be interesting to railroad engineers and machinists, we insert here the conditions required and the premium offered by the Baltimore and Ohio Railroad Company for the best locomotive of American manufacture, which were referred to in Mr. Latrobe's letter to the author:

"Office of the Baltimore and Ohio Railroad Company,
"*January* 4, 1831.

"The Baltimore and Ohio Railroad Company, being desirous of obtaining a supply of locomotive-engines of American manufac-

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ture, adapted to their road, the president and directors hereby give public notice that they will pay the sum of four thousand dollars for the most approved engine which shall be delivered for trial upon the road, on or before the 1st of June, 1831; and they will also pay three thousand five hundred dollars for the engine which shall be adjudged the next best, and be delivered as aforesaid, subject to the following conditions, to wit:

"*First.* The engine must burn coke or coal, and must consume its own smoke.

"*Second.* The engine, when in operation, must not exceed three and one-half tons' weight, and must, on a level road, be capable of drawing, day by day, fifteen tons, inclusive of the weight of the wagons, fifteen miles per hour. The company to furnish wagons of Winans's construction, the friction of which will not exceed five pounds to the ton.

"*Third.* In deciding on the relative advantages of the several engines, the company will take into consideration their respective weights, power, and durability, and, all other things being equal, will adjudge a preference to the engine weighing the least.

"*Fourth.* The flanges are to run on the inside of the rails. The form of the cone and flanges, and the tread of the wheels, must be such as are now in use on the road. If the working-parts are so connected as to work with the adhesion of all the four wheels, then all the wheels shall be of equal diameter, not to exceed three feet; but if the connection be such as to work with the adhesion of two wheels only, then those two wheels may have a diameter not exceeding four feet, and the other two wheels shall be two and a half feet in diameter, and shall work with Winans's friction-wheels, which last will be furnished upon application to the company. The flanges to be four feet seven and a half inches apart, from outside to outside. The wheels to be coupled four feet from centre to centre, in order to suit curves of short radius.

"*Fifth.* The pressure of steam not to exceed one hundred pounds to the square inch, and, as a less pressure will be preferred, the company, in deciding on the advantages of the several engines, will take into consideration their relative degrees of pressure. The company will be at liberty to put the boiler, fire-tube, cylinder, etc., to the test of a pressure of water not exceeding three times the pressure of the steam intended to be worked, without being answerable for any damage the machine may receive in consequence of such test.

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"*Sixth.* There must be two safety-valves, one of which must be completely out of the reach of the engine-man, and neither of which must be fastened down while the engine is working.

"*Seventh.* The engine and boiler must be supported on springs and rest on four wheels, and the height from the ground to the top of the chimney must not exceed twelve feet.

"*Eighth.* There must be a mercurial gauge affixed to the machine, with an index-rod, showing the steam-pressure above fifty pounds per square inch, and constructed to blow out at one hundred and twenty pounds.

"*Ninth.* The engines which may appear to offer the greatest advantages will be subjected to the performance of thirty days' regular work on the road; at the end of which time, if they shall have proved durable, and continue to be capable of performing agreeably to their first exhibition, as aforesaid, they will be received and paid for as here stipulated.

"P. E. THOMAS, *President.*

"N. B.—The railroad company will provide and will furnish a tender and a supply of water and fuel for trial. Persons desirous of examining the road, or of obtaining more minute information, are invited to address themselves to the president of the company. The least radius of curvature of the road is four hundred feet. Competitors who arrive with their engines before the 1st of June, will be allowed to make experiments on the road previous to that day.

"The editors of the *National Gazette*, Philadelphia, *Commercial Advertiser*, New York, and *Pittsburg Statesman*, will copy the above once a week, for four weeks, and forward their bills to the Baltimore and Ohio Railroad Company."

As Mr. Latrobe says in his letter before quoted, Phineas Davis's engine, built at York, Pennsylvania, was the only one which came up to the requirements of the company. After a trial, and several modifications and changes, each as it suggested itself, late in the summer of 1831, the Davis (or rather "Davis and Gartners") engine was found capable of pulling on the part of the road between Baltimore and Ellicott's Mills,

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thirteen miles, four loaded cars of the gross weight of fourteen tons, in about one hour.

This engine was mounted on wheels like those of the ordinary cars, thirty inches in diameter, and its velocity was effected by means of gearing with a spur-wheel and pinion on one of the axles of the road-wheels.

In the construction of the road from Baltimore to the Point of Rocks, every mode hitherto suggested by science or experience had been tested, and thus the work must be regarded as having the honor of solving most of the problems which presented themselves in this early period of railroads in this country. The granite, and the iron rail; the wood and iron, on stone blocks; the wood and iron on wooden sleepers, supported by broken stone; the same supported by longitudinal ground-sills in place of broken stones; the log-rail, formed of trunks of trees, worked to a surface on one side to receive the iron, and supported by wooden sleepers; and the wrought-iron rails of the English mode—had all been laid down, and as early as 1832 formed different portions of the work. Great credit is therefore due to the engineers and workmen of this road, for the patience displayed in carrying out their work, at that time the longest in the world; nothing in England could approach it in the magnitude and extent of its plan. These men labored long, at great cost, and with a diligence which is worthy of all praise. Their road and workshops have been a lecture-room to thousands who are now practising and improving upon their hard-earned experience.

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CHAPTER XXVII.

FIRST AMERICAN LOCOMOTIVE.

While these events were transpiring in Maryland, through the progress of the Baltimore and Ohio Railroad, a similar enterprise, nearly equal in its magnitude, and fully so in importance, had been started in another section of the country. The practicability of establishing a railroad communication between the city of Charleston, South Carolina, and Hamburg, on the western border of the State, a distance of one hundred and thirty-six miles, must have been talked of, and even some primary steps taken for its consummation, as early as 1827. We have seen, in an old file of the *Charleston Courier*, dated December, 1827, the following copy of a letter from Columbia, the capital of the State, where the Legislature was in session at the time. It says:

"The committee to whom the Charleston memorial was referred is divided in opinion on the propriety of an appropriation for the survey of the country between Charleston and Hamburg. Some of the committee think that if the railroad is to be the work of a company, who is to receive all the profits, the whole expense should be borne by the company. And again, that if a survey be effected by the State, it would not be done so satisfactorily to the community as it probably would be if managed by individuals immediately interested."

However, a bill, granting a charter for the South Carolina Railroad, was passed December 19, 1827. Fifteen days after, on January 4, 1828, a meeting of the citizens was called, and a committee appointed to report on that charter at the next meeting. The second

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meeting was called in the *Charleston Courier*, January 7, 1828, as follows:

"A meeting of the citizens is requested at the City Hall, this day, at 1 o'clock, to take into consideration the report of the committee on the subject of the railroad from this city to Hamburg. At a previous meeting on January 4th, the sub-committee had reported unfavorably. This committee pointed out many parts of the General Act of the Legislature for incorporating companies for constructing turnpike-roads, bridges, and ferries, that were inapplicable to a railroad company, as the bill now before the Legislature."

On the reassembling of the Legislature, January 21, 1828, after the usual Christmas recess, Mr. Black presented a memorial praying amendments to the act of the last session, and a new bill was reported on the 22d.

January 29, 1828, the present charter of the South Carolina Railroad was granted. A motion had been made to strike out the provision exempting the property of the road from taxation. The yeas and nays were taken—yeas 13, nays 22—and the bill passed.

The stockholders organized as a company on the 12th of May, 1828, being the second railroad company formed in the United States for commercial purposes and the transportation of passengers and freight.

At one of the earliest meetings of the projectors, Horatio Allen, Esq. (before mentioned), well known as an experienced engineer, had been invited by them to fill the position of chief engineer of the contemplated work. In compliance with their request, Mr. Allen made a report at the first meeting, five days after their organization, recommending the kind of road to be constructed and the kind of power best calculated to be used upon the road. Having visited England to examine the progress so far made in railroads and locomo-

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tive power, and having been requested, while in England, by John B. Jervis, Esq., chief engineer of the Delaware and Hudson Railroad, to contract for the iron for that road, and procure for it three first-class locomotives, the Charleston Railroad directors had confidence in his skill and judgment. In his report at this first meeting, Mr. Allen used all the arguments at his command to recommend the construction of the road for locomotive-power, and with such success that at the meeting on January 14, 1830, when the report was acted upon, the Hon. Thomas Bennett offered a resolution to the effect that the locomotive alone should be used upon the road, and in selecting that power for its application to railroads, the maturity of which will be reached within the time of constructing the road, would render the application of animal power a great abuse of the gifts of genius and science. The resolution was unanimously carried.

At the celebration in Dunkirk, New York, in 1852, in commemoration of the completion of the New York and Erie Railway, Mr. Allen, alluding to this subject in his address, makes use of the following language:

"At the same period, that is, prior to the great locomotive trial in England, and when the Baltimore and Ohio Railroad Company were so strongly impressed in favor of horse-power, it became necessary for me, as engineer of the South Carolina Railroad Company, to decide for what power that road should be built. The road was one hundred and thirty-six miles long. From the character of the country, the plan of the road would be naturally influenced by the kind of power adopted. Stationary power was out of the question, but the opinion was held, by many of great intelligence, that horse-power should at least be commenced with. In the report I made on this important question, I submitted such comparative estimate of the results of horse-power and locomotive-power as the information then to be had appeared to me to sustain. That estimate was in

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favor of locomotive-power, but I rested the decision of the question on the position that, what the performance of a horse was and would be, every one knew; but the man was not living who would undertake to say what the locomotive was yet to do; and I may add that, after more than thirty years have elapsed, during every one of which the soundness of this position has gained new grounds to sustain it, he would be a bold man who would say that we had attained the limit in the performance, and especially in the economy of performance, of this great mechanical blessing to mankind. In the recommendation of this report in favor of locomotive-power the Board of the South Carolina Railroad Company unanimously concurred, and, as this decision was the first on any railway built for general freight and passenger business in this country or in England, it has been referred to as one of the interesting facts in the early history of railroads."

The preparations for the work were at once commenced, and the road was begun in 1829. Six miles were completed in that year.

Like the Baltimore and Ohio Railroad, a number of experiments were tried with different powers.

The company offered a premium of $500 for the best locomotive by *horse-power*. This premium was awarded to Mr. C. E. Detmole, who invented one worked on an endless-chain platform. When this horse-power locomotive was completed and tested upon the road, it carried twelve passengers at the rate of twelve miles an hour.

A sailing-car, or a car propelled by the wind, was also tested upon the road in 1829–'30. A description of one of the trips upon this machine we copy from the *Charleston Courier*, March 20, 1830:

"Sailing on Land.—A sail was set on a car on our railroad yesterday afternoon, in the presence of a large concourse of spectators. Fifteen gentlemen got on board and flew off at the rate of twelve to fourteen miles an hour. Thirteen persons and three tons of iron were carried about ten miles an hour. The preparations

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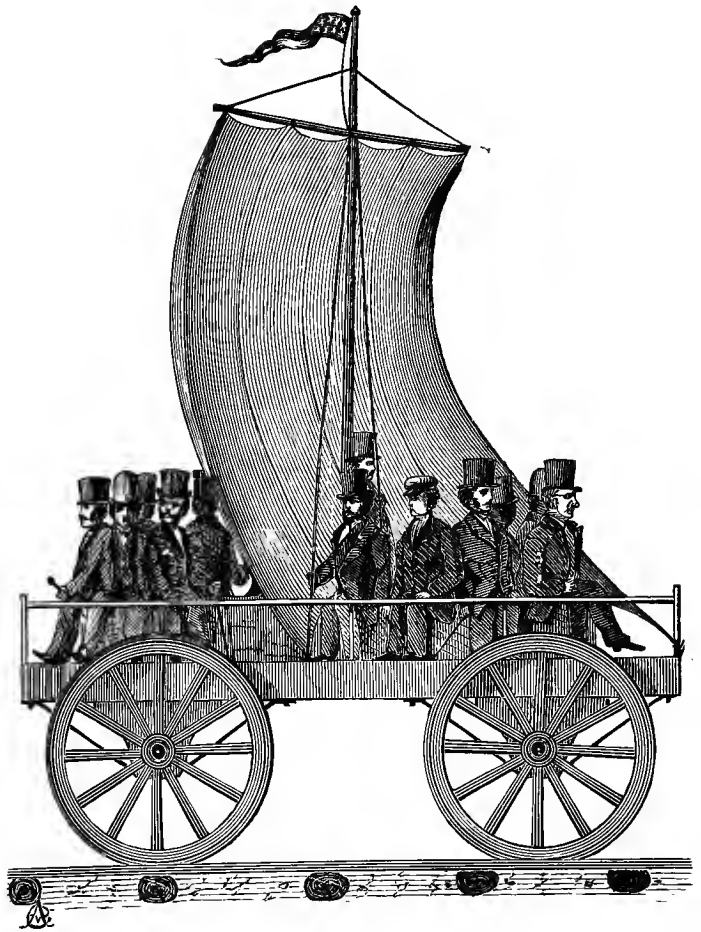
HORSE-POWER LOCOMOTIVE.

Horse-power Locomotive invented by C. E. Detmole, the successful competitor for the prize of $500 offered by the South Carolina Railroad, as it appeared on this road in 1829-30.

SAILING CAR.



Sailing Car as it appeared with a party of excursionists on the South Carolina Railroad, March 19, 1830.

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for sailing were very hastily got up, and of course were not of the best kind; but owing to this circumstance the experiment afforded high sport. The wind blew very fresh from about northeast, which, as a sailor would say, was 'abeam,' and would drive the car either way with equal speed. When going at the rate of about twelve miles an hour and loaded with fifteen passengers, the mast went by the board, with the sail and rigging attached, carrying with them several of the crew. The wreck was descried by several friendly shipmasters, who kindly rendered assistance in rigging a jury-mast, and the car was again soon put under way. During the afternoon the wind changed so as to bring it nearly ahead when going in one direction; but this did not stop the sport, as it was ascertained that the car would sail within four points of the wind. We understand it is intended by some of our seamen to rig a car properly, and shortly to exhibit their skill in managing a vessel on land."

The president of the road, Mr. Tupper, in one of his reports to the board, informs them that on March 1, 1830, the committee to whom the matter was referred had reported that they had accepted the offer of Mr. E. L. Miller, of Charleston, to construct a locomotive at the West Point Foundery, in New York, and that it should perform at the rate of ten miles per hour, instead of eight, as first proposed, and carry three times her weight, which was required the year before, on the Liverpool and Manchester Railroad, at the trial for the premium of £500.

Mr. Miller immediately set about the construction of his locomotive. His plans and specifications were drawn out by the same Mr. Detmole, who had invented the horse-power locomotive on the Charleston road, and who was then living in New York.

Meantime the work on the road was pushed forward, and another mile completed, making seven miles ready for use, and many more under contract and fast approaching completion.

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CHAPTER XXVIII.

FURTHER TRIALS.

Mr. David Matthew, who was foreman of the hands fitting up machinery in the West Point Foundery, and had charge of those fitting up the Stourbridge Lion, when she came from England, also had charge of the men fitting up the "Best Friend," the first locomotive ever built in America, for actual service on a railroad. In the same letter, which he addressed to the author in 1859, after describing the Stourbridge Lion, he thus continues:

"The first American-built locomotive for actual service upon a railroad was called the 'Best Friend of Charleston.' I had charge of the hands fitting up this engine; this was in 1830, shortly after the Stourbridge Lion had been tried in our yard, and some modifications made to it. The locomotive 'Best Friend of Charleston' was contracted for by Mr. E. L. Miller, of Charleston. The Best Friend was a four-wheel engine, all four wheels drivers. Two inclined cylinders at an angle, working down on a double crank, inside of the frame, with the wheels outside of the frame, each wheel connecting together outside, with outside rods. The wheels were iron hub, wooden spokes and felloes, with iron tire, and iron web and pins in the wheels to connect the outside rods to.

"The boiler was a vertical one, in form of an old-fashioned porter-bottle, the furnace at the bottom surrounded with water, and all filled inside full of what we called teats, running out from the sides and top, with alternate stays to support the crown of the furnace; the smoke and gas passing out through the sides at several points, into an outside jacket; which had the chimney on it. The boiler sat in the centre of the four wheels, with the connecting-rods running by it to come into the crank-shaft. The cylinders were about six inches in the bore, and sixteen inches' stroke. Wheels about four and a half feet in diameter. The whole machine weighed about four and a half tons. It was

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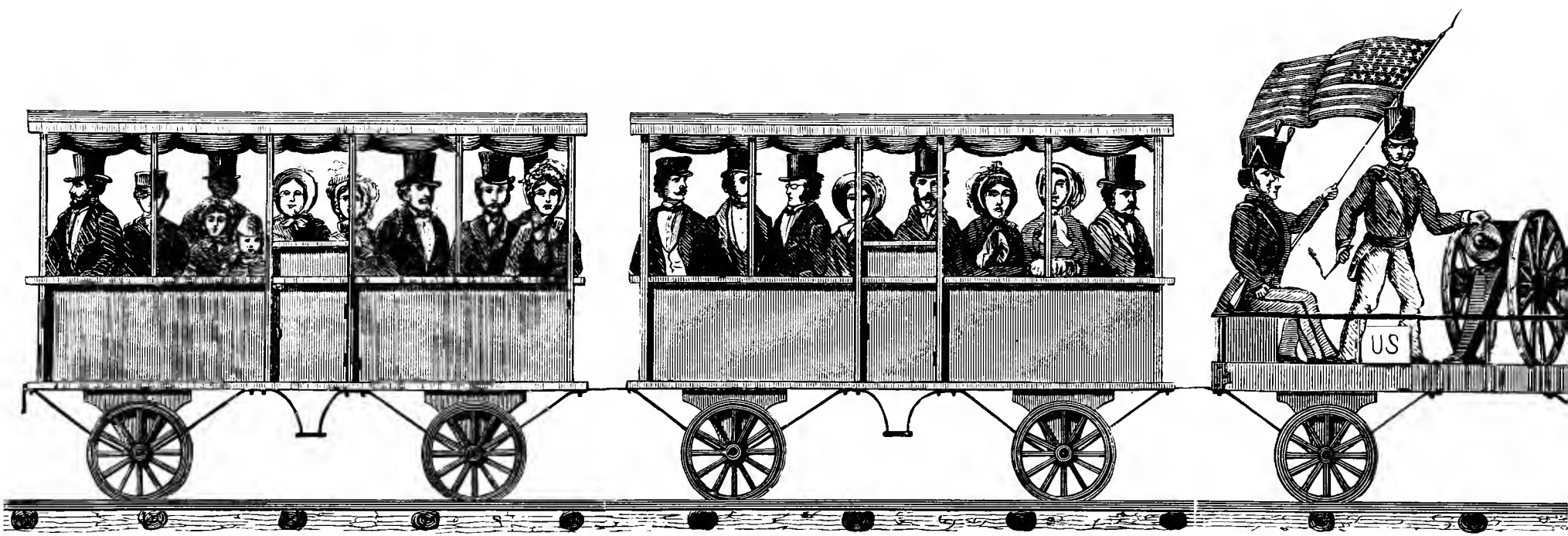
The "Best Friend," the First Locomotive built in the Unite



The "BEST FRIEND" was built at the West Point Foundry Shops, in New York City, for the South Carolina Rail-Road, and after several
on Saturday, 15th January, 1831, being the anniversary of the commencement of the roa

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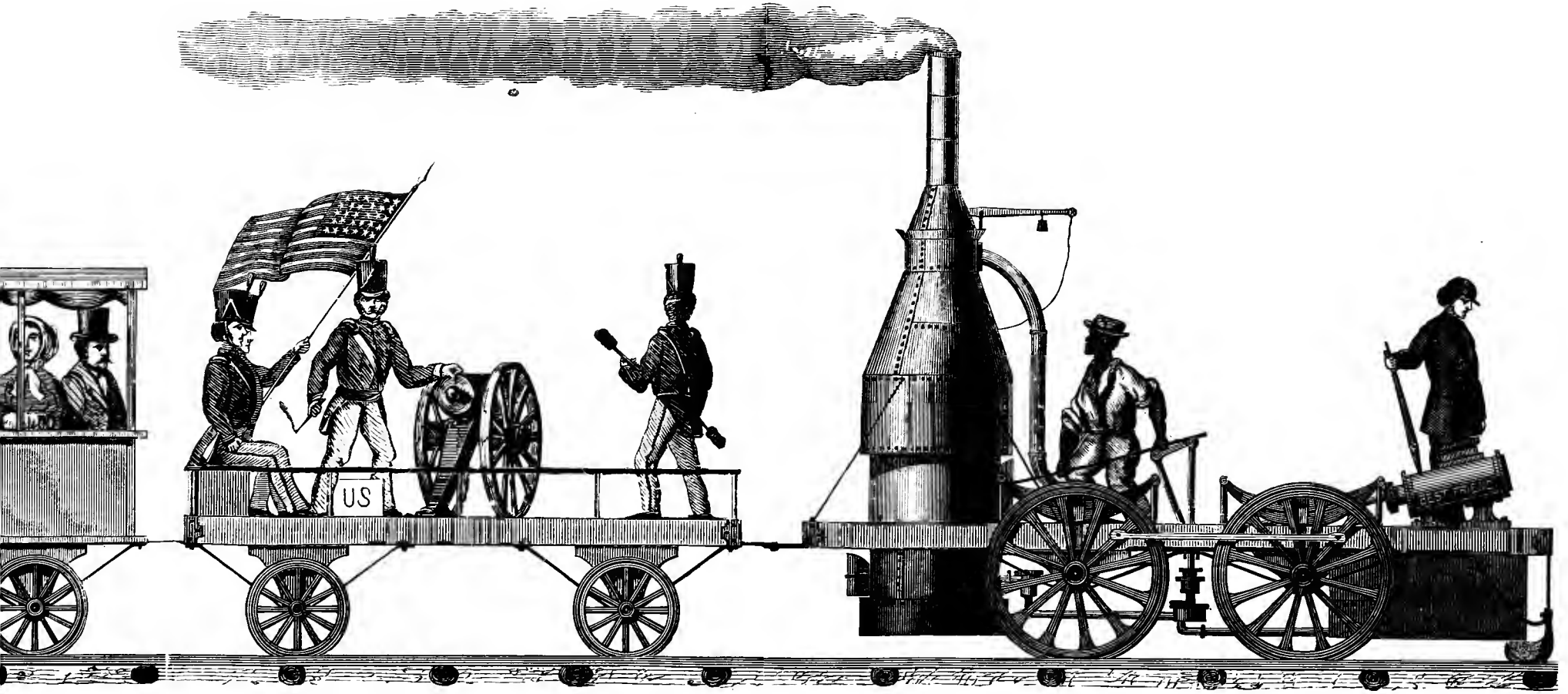
;ive built in the United States for actual service on a Railroad



or the South Carolina Rail-Road, and after several experimental trials, in November and December, 1830, made the first excursion trip, as above, ing the anniversary of the commencement of the road. See extract from *Charleston Courier*, page 152.

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shipped to Charleston, South Carolina, for the Charleston and Hamburg Railroad, in the fall of 1830, and was put upon that road during the winter.

"It was the first locomotive built in America, was exhibited at our shop under steam for some time, and visited by many. She was shipped to Charleston on board of the ship Niagara, in October, 1830."

Prof. Samuel Henry Dickson, of the Jefferson Medical College of Philadelphia, in a recent letter to the author, describes his visit to the West Point Foundery-works in New York, in 1830. At this time the "Best Friend of Charleston," the first locomotive ever built in America, for actual service upon a railroad, was just completed, and about to be shipped to Charleston. Prof. Dickson writes as follows:

"PHILADELPHIA, *May* 30, 1871.

"WM. H. BROWN, ESQ.—

"DEAR SIR: In reply to your courteous letter of inquiry, just received, I regret that I can give you nothing better than general though very definite reminiscences. Dates, circumstantial details, and printed statements, such as would best suit your purpose, have faded from my mind, and all written memoranda of that distant time have perished amid the general ruin at the South.

"But I recollect that, being on a tour among my Northern friends in the summer of 1830, I was written to on the part of the board of directors of the Charleston and Hamburg Railroad (the South Carolina Railroad), and requested, as one of that body, to visit the foundery of Mr. Gouverneur Kemble, to look at a locomotive-engine which he was building for our road, and report as to its general appearance, and the prospect of its completion by the appointed time.

"Our contract had been made with Mr. E. L. Miller, who engaged with Mr. Kemble to build the machine. Mr. Miller accompanied me to the workshop, where I saw with intense interest and great satisfaction, not unmixed with some pride too, the first locomotive constructed in this country. Never having seen a locomotive, and being neither engineer nor mechanic, I could not of course presume to pronounce upon its merits, and was as curious

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and anxious about the result of our experiment as any one interested. But I had read and heard a good deal on the subject, and did not hesitate to recommend the prompt acceptance of the engine from the contractor, and to congratulate my fellow-directors upon its promise of decided utility and advantage to our great enterprise.

"Mr. Miller named it, I think, 'The Best Friend,' and it was forwarded to Charleston late that fall or early in the winter, when it was at once put upon the road. It did not disappoint our hopes, but proved in capacity and serviceable qualities all that we had expected. It was run long and successfully, under the charge of Mr. Darrell, one of our young native machinists. I am under the impression that it was one day blown up through the carelessness of a negro fireman, that it was soon repaired and replaced upon the road. Of its ultimate fate I am not certain, but believe that, after having attained a ripe old age, in process of time it finally wore out, and was thrown aside, the common destiny of man and all his works.

"I am glad to hear of the gratifying progress of your book, and know that its publication will not long be delayed. Wishing you the large and profitable success, as an author, which your energy and perseverance so richly deserve, and all other forms of happiness and prosperity,

"I remain, very truly,

"Your friend and obedient servant,

"SAMUEL HENRY DICKSON."

The author examined the order-book recently at the West Point Company's Foundery, at Cold Spring, Putnam County, on the Hudson River, for some reminiscences of the old "Best Friend," but all he could find (the old books having been lost or mislaid) was the following order from the New-York office, dated April 6, 1830, as follows: "Two cylinders, see pattern locomotive-engine, nozzles for exhaust cast right and left."

The above shows that the engine was commenced, as Mr. Matthew states, in the spring of 1830.

The following paragraph appeared in the *Charleston Courier*, October 23, 1830:

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"LOCOMOTIVE STEAM-ENGINE.—"We understand that the steam-engine intended for our road is on board the ship Niagara, which arrived in the offing last night."

As no machinist came out with the locomotive, the superintendent of the railroad applied to Mr. Thomas Dotterer, of the firm of Dotterer & Eason, machinists and engineers, to put the machine together and prepare her for the road. These gentlemen appointed Mr. Julius D. Petsch, who was foreman in their workshops, to discharge this duty. Mr. Petsch, at their request, undertook the task, and selected as an assistant Mr. Nicholas W. Darrell, a young man just out of his time in their workshops. These gentlemen (Mr. Petsch and his assistant Mr. Darrell) immediately set about fitting up the "Best Friend" for the road, and so energetically did they work that in a few days all was ready. Before the 1st of November, several experimental trials, at short distances, were made to see that all was right; and on the 2d of November, with Mr. Darrell in charge, Mr. Miller, accompanied by several gentlemen in a car, made a trial-trip.

The result of this trial-trip we learn from the following letter from the chief engineer, Horatio Allen, in the *Charleston Courier*, November 3, 1830:

"The public will regret to learn that an accident has happened to a pair of the wheels of the locomotive-engine lately put upon the railroad. To prevent any misunderstanding or exaggeration, it is proper to communicate the facts. The change of direction which takes place when a carriage enters a curved part of a road is effected by the action of the flange which is attached to the rim against the iron rail. A lateral strain is then brought to act on the spokes of the wheel, and in this present instance they have proved too weak to resist it, and from this circumstance the accident has originated. The spokes were discovered to spring, and fears were entertained by Mr. Miller, shortly after he commenced

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running his engine. Yesterday he experimented with it for this especial purpose, and after having proceeded to the extremity of the road, and almost completed his return, during which time the operation of the engine was in the highest degree satisfactory, the forward wheel was sprung inward, so much so as to leave the rail entirely; and the engine, after proceeding about twenty feet, was stopped with both the front wheels off the rail, and some of the spokes much injured.

"It is as singular as satisfactory that no other part of the frame, machinery, or boiler, exhibited the least derangement, affording the most decisive proof of the correctness of the proportions and the excellence of the work. It is but justice to state that the wheels were made after the English wheels, the most approved until the construction of the wrought-iron ones. A short time will be required to replace the wheels, when the engine will again be put in motion.

"No personal injury happened to any of the individuals, either on the passenger-car or engine.

"HORATIO ALLEN."

We next hear of the "Best Friend" through the report of President Tupper to the board of directors. After speaking of Mr. Miller's contract to furnish a locomotive, etc., he continues:

"On the 14th and 15th of December, 1830, the engine was tried, and proved her force and efficiency to be double that contracted for; running at the rate of sixteen to twenty-one miles an hour, with forty to fifty passengers in some four or five cars, and, without the cars, thirty to thirty-five miles per hour."

"Jockey of York," an amusing sporting writer, gives an account of a trip on Christmas-day, in his peculiar style, in the *Charleston Courier*, December 29, 1830:

"SPORTING INTELLIGENCE.—Our distant friends no doubt are desirous to know the result of our Christmas sports. The celebration season was altogether novel and interesting. The iron horse 'Best Friend' was entered for the purse, about a fortnight since, to 'run against time.' The 'heat' was, that he should run ten

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miles an hour, carrying three times his own weight. He was trained every day preparatory to the great trial of speed. Doubts were at first entertained as to 'his wind,' when everybody acknowledged he had sufficient 'bottom.' The 'Best Friend' is out of a horse bred by Messrs. Watt & Bolton, and of the same breed as the Novelty and Rocket, which contended for the purse of £500, at the late Liverpool and Manchester races. By crossing the breed with a Columbian sire, he has 'eclipsed' his progenitors upon the European, and stands unrivalled upon the American turf. The knowing ones have already hinted that his dam was 'half salamander, half alligator' as he eats fire, breathes steam, and feeds upon light-wood. All doubts, however, of his being 'short-winded' have been dissipated, and it is now confidently believed that he can run one hundred miles without 'flagging,' for, like Pat, after the foot-race at Donnybrook Fair, when being questioned if he was 'out of breath,' he replied, 'No, faith, I'm only likely to be troubled with too much of it.' But, Mr. Editor, allegory apart, I am the 'odd fellow' of the one hundred and forty-one persons who were drawn or rather whisked through the air by the iron horse or locomotive-engine, on Christmas-day—

> 'Which sped through the air like a meteor swift,
> While the crowds from around it did fearfully drift
> To the right and the left, as it passed.'

"We flew on the wings of the wind at the varied speed of fifteen to twenty-five miles an hour, annihilating 'time and space,' and, like the renowned John Gilpin, 'leaving all the world behind.' A venerable friend of mine, seventy-five years of age, gravely remarked he thought it was passing through life rather too quick, as the journey at least was a very short one. 'Very true, my good sir,' said I. 'We cannot, however, just now take time for those sage reflections on matters and things in general so necessary to our mental and moral improvement.' It was nineteen minutes five and one-fourth seconds since we started, and we discovered ourselves beyond the forks of the State and Dorchester roads. Somebody exclaimed the engine was 'waltzing.' I looked around, and 'tis a fact, Mr. Editor; notwithstanding the apparent absence of every moving principle of grace or agility, it turned round as nimbly as a miss of sixteen: but I swear by the spectacles I shall one day or other wear, that either the road or the engine turned round like a top—in proof of which I appeal to my

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own pumps—if it did not afterward *chassé* to the left and remain there until the three cars led off a country-dance before it. Never did reviewing general present a more warlike front to troops passing on line of march than did this same knight-errant, 'clad in his iron-bound armor.' As each car came in front, it gave us three whiffs of steam in acknowledgment that the compliment to our company was felt and appreciated. Never were the three ruffles of the drum more gratifying to my feelings when military ardor 'fired my breast.' On our return, it again headed the column. We came to Sans-Souci in quick and double-quick time. Here we stopped to take up a recruiting-party—darted forth like a live rocket, scattering sparks and flames on either side—passed over three salt-water creeks, hop, step, and jump, and landed us all safe at the Lines before any of us had time to determine whether or not it was prudent to be scared. It beats the Dumb Chess-Player all hollow. Your obedient servant,

"JOCKEY OF YORK."

One more account of the performances of the "Best Friend," and we will leave her running upon the railroad in her daily routine of duty.

These extracts, from one of the most respectable journals of the time, will tend to prove that as early as the months of November and December, 1830, and January, 1831, the "Best Friend" was in existence, and running upon the South Carolina Railroad:

From the Charleston Courier, January 17, 1831.

"On Saturday last, the first anniversary of the commencement of the railroad was celebrated. Notice having been previously given, inviting the stockholders, about one hundred and fifty assembled in the course of the morning at the company's building in Line Street, together with a number of invited guests. The weather the day and night previous had been stormy, and the morning was cold and cloudy. Anticipating a postponement of the ceremonies, the locomotive-engine 'Best Friend, of Charleston,' had been taken to pieces for cleaning, but upon the assembling of the company she was put in order, the cylinders new packed, and at the word, the apparatus ready for movement. The first trip

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was performed with two pleasure-cars attached, and a small carriage, fitted for the occasion, upon which was a detachment of United States troops and a field-piece which had been politely granted by Major Belton for the occasion.

"Upon the return of the engine, it was found necessary to tighten the packing, which occasioned some little delay. At about one o'clock she again started with three cars attached, upon which were upward of one hundred passengers. At two o'clock a Federal salute was fired by the detachment of troops stationed upon the remains of the fortification erected during the Revolution near the Quarter House. At four o'clock the company commenced returning, and were all safely landed at Line Street before six. The number of passengers brought down, which was performed in two trips, was estimated at upward of two hundred. A band of music enlivened the scene, and great hilarity and good-humor prevailed throughout the day."

The "Best Friend" continued to do the necessary work of the road, hauling materials, workmen, ballast, lumber, etc., used in the construction, during all of which time she was in charge of Mr. Nicholas W. Darrell, who had assisted Mr. Petsch in putting her together and on the road when she first came out to Charleston.

CHAPTER XXIX.

EXPLOSION OF "BEST FRIEND."

On Friday the 17th of June, 1831, the boiler of the "Best Friend" exploded. As this is the first boiler-explosion upon a locomotive on record in America, we will give the account of the accident and its consequences, from an article in the *Charleston Courier*, June 18, 1831:

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"SATURDAY MORNING, *June* 18, 1831.

"The locomotive 'Best Friend' started yesterday morning to meet the lumber-cars at the Forks of the Road, and, while turning on the revolving platform, the steam was suffered to accumulate by the negligence of the fireman, a negro, who, pressing on the safety-valve, prevented the surplus steam from escaping, by which means the boiler burst at the bottom, was forced inward, and injured Mr. Darrell, the engineer, and two negroes. The one had his thigh broken, and the other received a severe cut in the face and a slight one in the flesh part of the breast. Mr. Darrell was scalded from the shoulder-blade down his back. The boiler was thrown to the distance of twenty-five feet. None of the persons are dangerously injured except the negro, who had his thigh broken. The accident occurred in consequence of the negro holding down the safety-valve while Mr. Darrell, the engineer, was assisting to arrange the lumber-cars, and thereby not permitting the necessary escape of steam above the pressure the engine was allowed to carry."

The wreck of the "Best Friend" was sent to the shops of Mr. Dotterer for repairs and such alterations as were found upon experiment to be necessary.

Railroad men of the present day will no doubt ask, "Why was the engineer, Mr. Darrell, not at his post upon the engine, and why was he attending to the arrangement of the lumber-cars, leaving his engine in charge of his negro fireman?" To these questions we will reply by stating that, at that early day in railroad affairs, no such officers of a train as conductors, flagmen, or brakemen, had been instituted. The engineers of locomotives, like the drivers of the old-fashioned stage-coaches in by-gone days, and of the horse-cars used upon railroads, had to do their own hitching up, etc. Hence the reason why Mr. Darrell was not on the engine during the arrangement of the train. At that time every thing had to be learned as the necessity demanded it. Previous to the explosion of the "Best Friend," an

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accident occurred at a switch, which is explained by Mr. Allen, the chief engineer, and which called for a new order from the directors, which we will insert as an illustration of our remarks in the case of the explosion:

"CHARLESTON, *May* 14, 1831.

"TO ELIAS HORRY, ESQ., PRESIDENT—

"SIR: I hasten to communicate the causes which produced the accident of yesterday afternoon. It originated in the wild derangement of the tongue, which guides the wheel through the turnout, by some ill-disposed person, and was rendered injurious to the car by the imprudent speed allowed by those who had the management of the engine—the tongue having been nailed to its proper position, but was made loose by removing the fastening, and was probably shaken from its place by the speed with which the engine and one car had preceded the one injured. Directions have been given to pass the turnout at moderate speed, and the attention of the person in charge to be constantly kept on the road in advance of the engine.

"Respectfully, your obedient servant,

"HORATIO ALLEN."

Extract from the minutes, July 3, 1831, in reference to the order above alluded to by Mr. Allen:

"*Resolved*, That in future not over twenty-five passengers be allowed to go on each car. That the locomotive shall not travel at a greater speed when there is attached:

"One car and passengers at fifteen miles an hour.

"Two cars and passengers at twelve miles an hour.

"Three cars and passengers at ten miles an hour.

"And that directions be given to that effect."

The foregoing will no doubt draw a smile upon the faces of engineers and railroad-men of the present day. It only serves to show the crudeness of railroad experience, at that early day, of locomotives.

The following letter from Mr. Nicholas W. Darrell,

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the first locomotive-engineer in America, will, we trust, be read with interest, especially by his fellow-engineers and railroad-men. It was received in answer to some inquiries made of him by the author, in reference to the "Best Friend."

"CHARLESTON, *September* 2, 1869.

"MR. WM. H. BROWN—

"DEAR SIR: Your letter came to hand a few days ago, and I now hasten to reply to it, with all the information I can give you upon the subject at this distant day, drawn from memory alone, as I have no notes to which to refer.

"In the spring of 1830, Mr. E. L. Miller, of our city, entered into a contract to furnish the South Carolina Railroad with a locomotive that should travel ten miles an hour, and draw three times its own weight.

"Under this contract Mr. Miller brought out his engine, which was built at the West Point Foundery in New-York City.

"The engine arrived by the ship Niagara in Charleston, in the latter part of October, 1830. The engine was called the 'Best Friend, of Charleston.' Mr. Julius D. Petsch and myself had served our apprenticeship with Mr. Thomas Dotterer, of the firm of Dotterer & Eason, as machinists and engineers, and were engaged to put this engine together, and made the first run or trial-trip, when she proved equal to double the stipulations of the contract, running at the rate of sixteen to twenty-one miles an hour, with forty or fifty passengers in four or five cars, and making thirty to thirty-five miles per hour without cars. From this date I was regularly engaged as the engineer of the 'Best Friend,' the first locomotive ever built and run in this country, in the actual service of a company.

"In June, 1831, the boiler of the 'Best Friend' exploded, while in charge of myself. She was rebuilt by Mr. Thomas Dotterer, who substituted straight axles and cast wheels and wrought tires, for crank-axles and wood wheels with iron tires. Her name was also changed, and called the 'Phœnix.'

"During the repairs and alterations of the 'Best Friend,' a second engine, called the 'West Point,' arrived in Charleston, and was put upon the road. Of this engine I was also engineer. When the 'Phœnix' was repaired, she was run by Henry Raworth as engineer.

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"I continued to run the 'West Point' until the first eight-wheel engine was brought out, called the 'South Carolina,' built in New York, after plans of Mr. Horatio Allen, then chief engineer of the South Carolina Railroad.

"Julius D. Petsch, Nicholas W. Darrell (myself), John Eason, and Henry Raworth, were the first to run locomotives. We were all apprentices of Mr. Thomas Dotterer, and natives of Charleston. I have been constantly in the employ of the South Carolina Railroad from December 8, 1830, to the present time; was born on the 12th day of November, 1807.

"Attached is a rough sketch of the 'Best Friend,' made from recollection alone, yet I was so long upon the machine, and had her so many years before my eyes, that her general form and appearance can never be forgotten. I have shown the sketch to many of the old hands now living, and they all exclaim at once, 'There is the old "Best Friend!"'

"When I run the 'Best Friend,' I had a negro fireman to fire, clean, and grease the machine. This negro, annoyed at the noise occasioned by the blowing off the steam, fastened the valve-lever down and sat upon it, which caused the explosion, badly injuring him, from the effects of which he died afterward, and scalding me.

"I hope this information will be of service to you. If you require any other facts in reference to the first engines, let me hear from you.

"Yours with great respect,

"NICHOLAS W. DARRELL,

"*First Superintendent of Machinery,*

"*South Carolina Railroad.*"

The following letter from James M. Eason, Esq., of Charleston, South Carolina, who is a manufacturer of steam-engines, boilers, and machinery, will serve to establish the fact that, not only was the South Carolina Railroad the very first in the world built expressly for locomotives, but it was also the pioneer in having the first locomotive for actual service in America built for their use; also the first to order a locomotive to be built in their midst and by one of their own native mechanics and citizens:

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"Office of J. M. Eason & Brother, Manufacturers of
"Steam-Engines, Boilers, and Machinery.
"Charleston, S. C., *September* 24, 1869.

"William H. Brown, Esq.—

"Dear Sir: I enclose you a note from old Mr. Darrell, and also a photograph of him which I prevailed upon him to have taken for you.

"If of any interest to you, I could send you a photograph of Thomas Dotterer, who, in early railroad days, built the 'Native,' the first locomotive ever built with outside connections and straight axles. After the explosion of the 'Best Friend,' he changed her to straight axles and made iron wheels. Mr. Dotterer was considered one of the best natural mechanics of his day. J. D. Petsch, N. W. Darrell, Henry Raworth, John Eason, etc., were the early locomotive-engineers here, and were all apprentices of his. Every master-machinist in charge of the South Carolina Railroad machinery and shops, up to this day, was his apprentice.

"I remember the first trip of the 'Native.' She had been started out to run up the road, and I well remember the great prejudice which Mr. Dotterer had to encounter against his plan of outside connections, which was then urged to this effect: that the power, being applied to the end of the axle, would rack the road to pieces and the engine too; that the *thing* (not calling it an engine) would not do, etc. But, nothing daunted, he made the engine and sent it out. Evening came, and the locomotive, probably the second ever run on the road, certainly the first after the 'West Point,' did not arrive with the train. Great uneasiness was manifested by the officers of the company, for in those days everybody interested attended at the arrival of a locomotive. Finally night came on; neither the regular train nor the *little* 'Native' (for she only weighed about four tons) was in sight, and the murmurings could be heard in knots of persons and officials, that the damned *thing* had broken the road, or blown up, or some other casualty had happened to her, and prevented the arrival of the other locomotive and train.

"Now, my dear sir, imagine Mr. Dotterer's feelings; but behold him, the man of genius, standing amid the bickerings of men, almost fearing that his little engine was the cause of the delay, when a voice cried out, 'She's coming!' and the sparks from the smoke-pipe were observed (for in those days spark-arresters were not perfected). Then a general rush to hear the news, to see what

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caused the detention, and learn the fate of the poor home-made 'Native,' when lo! a cry from a faithful friend of Mr. Dotterer, 'Why, 'tis the Native pulling locomotive and train!' Then look at Thomas Dotterer, with a heart full, with tear-drops in his eyes, as the smile of successful championship and confidence in his work played upon his countenance. I stood beside him at that moment, and shared with him in his pride. If I had the time and the ability, I could gather many interesting facts of early railroad times here in our old city, for I can remember many things. But I only intended to enclose to you Mr. Darrell's letter and his photograph, and trust you will excuse me for thus intruding on your valuable time. Very respectfully, yours, etc.,

"JAMES M. EASON."

CHAPTER XXX.

SECOND AMERICAN LOCOMOTIVE.

THE second locomotive for the South Carolina Railroad, and also the second built in this country, arrived at Charleston by the ship Lafayette on Monday, February 28, 1831. This engine was ordered from the West Point Foundery, and constructed from plans sent by Horatio Allen, Esq., the chief engineer of the road. Of this locomotive, Mr. David Matthew, after describing in his letter to the author, in 1859, the "Stourbridge Lion" and the "Best Friend" locomotives, thus continues:

"American locomotive number two was called the 'West Point.' This engine was contracted for by Horatio Allen, and was commenced by me, *David Matthew*, in the fall of 1830, and completed and shipped to the Charleston and Hamburg Railroad about the middle of February, 1831. This locomotive had the same size of engine, frame, wheels, and cranks, as the 'Best Friend,' but had

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a horizontal tubular boiler. The tubes were two and a half inches in diameter and about six feet long."

After this engine was run upon the road for some time, a trial of her speed was made, which is thus described in the *Charleston Courier*, August 1, 1831:

"On Saturday afternoon, March 5, 1831, the locomotive 'West Point' underwent a trial of speed, with the barrier car and four cars for passengers, on our railroad. There were one hundred and seventeen passengers, of which number fifty were ladies in the four cars and nine persons on the engine, with six bales of cotton on the barrier car, and the trip to the Five-mile House, two and three-fourths miles, was completed in eleven minutes, where the cars were stopped to oil the axles about two minutes. The two and one-fourth miles to the forks of Dorchester road were completed in eight minutes. The safety has been insured by the introduction of the barrier-car * and the improvements in the formation of the flange of the wheels, which we learn was made by a young mechanic of this city, Mr. Julius D. Petsch, in the company's service. The new locomotive worked admirably, and the safety-valve being out of the reach of any person but the engineer, will contribute to the prevention of accidents in future, such as befell the 'Best Friend.'"

As we before stated, Mr. Nicholas W. Darrell was the engineer who ran this machine from the time it was put on the road. He thus describes it in a letter to the author:

"CHARLESTON, S. C., *September* 23, 1869.

"MR. WILLIAM H. BROWN—

"RESPECTED SIR: I have received your favor of the 22d of August, and would have answered it before this time, but, being quite indisposed in health, I have been prevented.

"It gives me pleasure to know that the information and sketch of the 'Best Friend' I sent in my last letter is of any service to you. I will now give you such information of the second locomo-

* A car with bales of cotton fixed up as a rampart between the locomotive and passenger cars.

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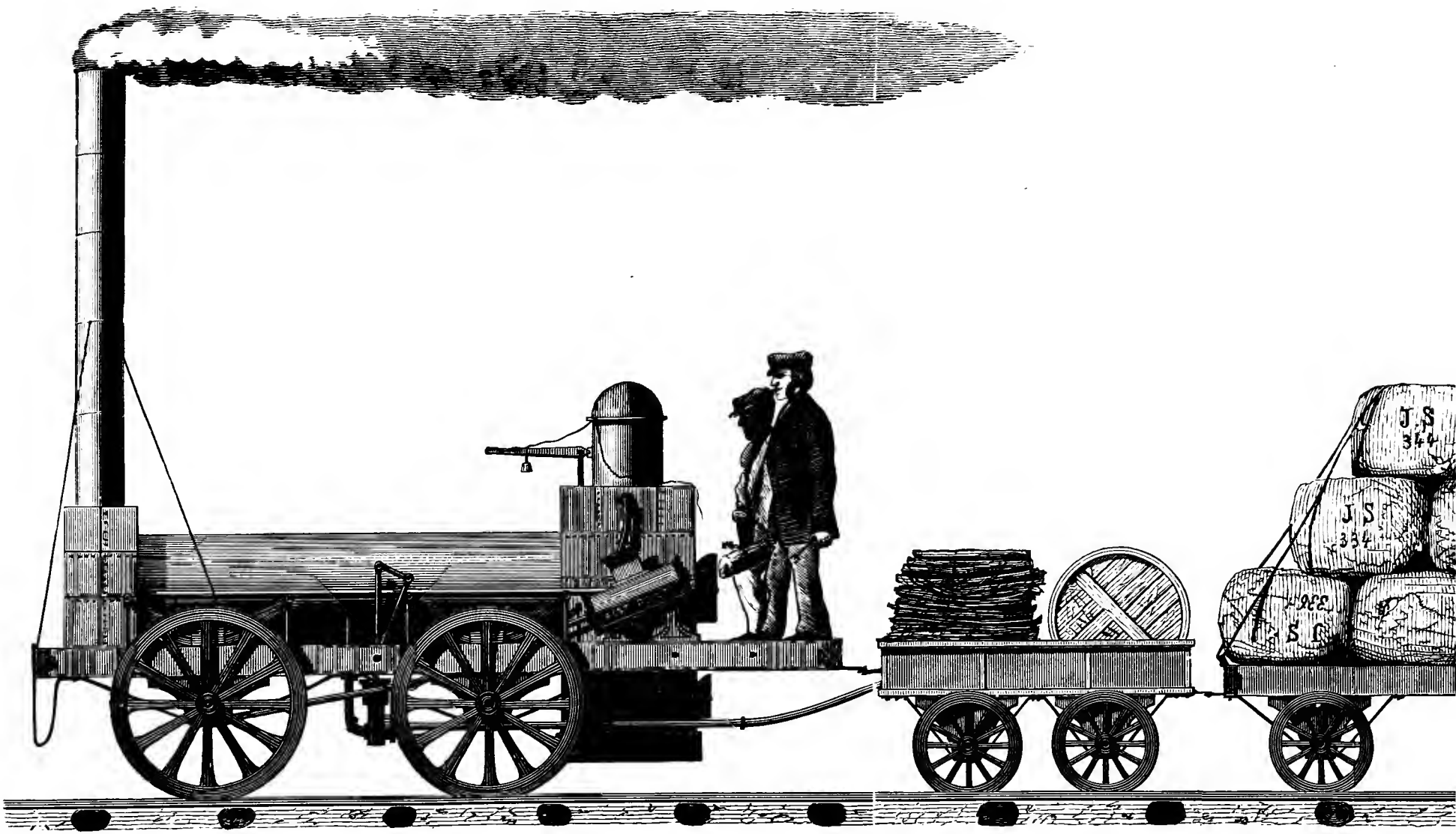
The "West Point," the Second Locom



The "WEST POINT" was built at the West Point Foundry Works, in New York City, for the South Carolina Rail-Road, a

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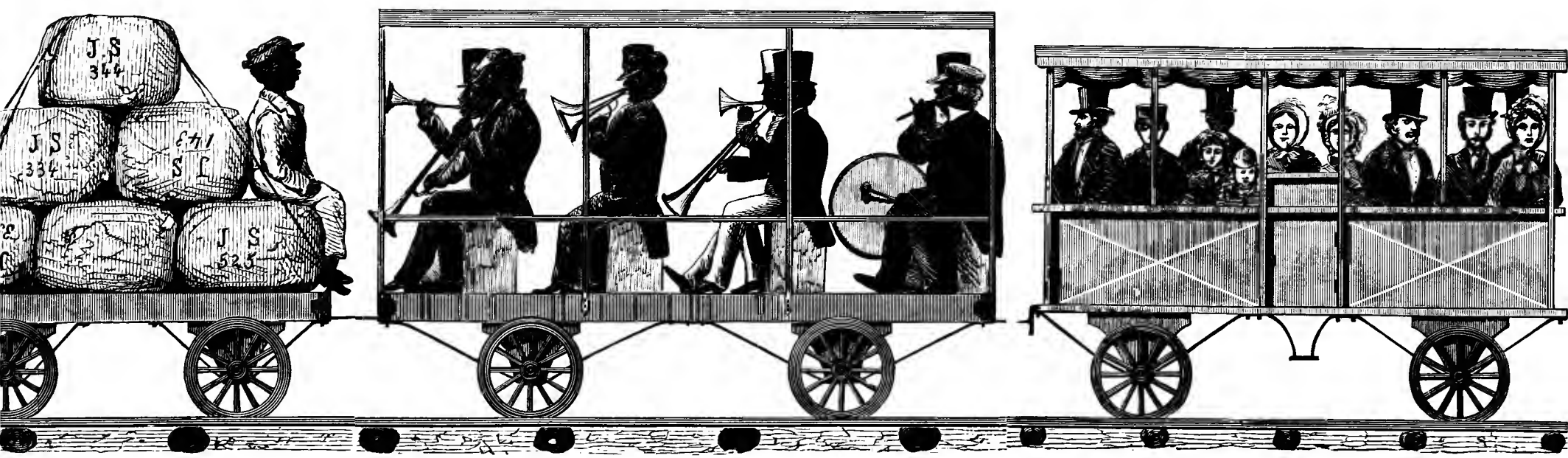
Locomotive built in the United States for actual service on a Rai



a Rail-Road, and after several experimental trials, in February, 1831, made the first excursion trip, as above, on Saturday afternoon, March 5th, 1831. See ex

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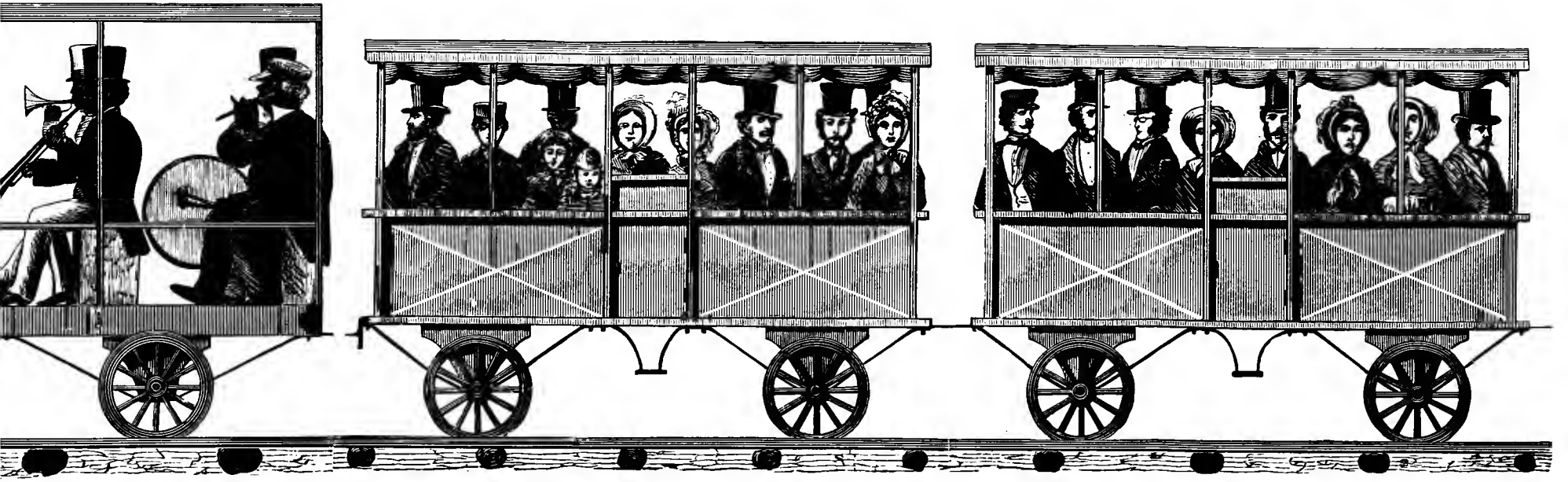
ed States for actual service on a Railroad.



made the first excursion trip, as above, on Saturday afternoon, March 5th, 1831. See extract from *Charleston Courier*, page 160.

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tive for our road as my memory serves. The engine was named the 'West Point.' The boiler was horizontal, with tubes or flues running lengthwise with the boiler, about five or six feet long and, I think, about three inches in diameter. I think their number was six or eight. These tubes, or flues, or whatever you may call them, were riveted to the fire-box and to the other end of the boiler. They were made of iron, and the water in the boiler surrounded them, and the flame and smoke passed through the tubes into the smoke-box.

"The engine was similar in every respect to the 'Best Friend,' except in the boiler. I herewith send you a rough sketch of the machine as near as I can recollect.

"Several persons now living, and who saw the engine at that time, think that the sketch looks very much like the old 'West Point.' Hoping that this brief information may lead to some more important results from some more valuable source, I remain, dear sir, Very respectfully, etc.,

"NICHOLAS W. DARRELL,

"*Formerly Superintendent of Machinery, South Carolina Railroad.*"

Tristram Tupper, Esq., the president of the South Carolina Railroad, in one of his reports under the head of "The History of the Road," gives an extract from the report of the Hon. Thomas Bennett, four days after the building of the road had commenced, as follows:

"The locomotive shall alone be used. The perfection of this power in its application to railroads is fast maturing, and will certainly reach, within the period of constructing our road, a degree of excellence which will render the application of animal power a gross abuse to the gifts of genius and science."

"This," continues Mr. Tupper, "was assuming a great deal, when animal power was used, years afterward, on all the other railroads then in progress in this country. But what, then, were our expectations as regards the performance of a locomotive?

"On March 1, 1830, a committee reported that they

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had accepted the offer of Mr. E. L. Miller to construct a locomotive-engine in New York, at the West Point Foundery; and that she should perform at the rate of *ten miles an hour*, instead of *eight* as first proposed, and carry three times her weight, which was required the year before on the Liverpool and Manchester Railroad, at a trial of engines for the premium of £500, which Mr. Miller went out to witness. Mr. Miller's engine, under this contract, was brought out by him in the fall of 1830, and on the 14th and 15th of December, 1830, had her trial and proved her power and efficiency to be double those contracted for. She was the first locomotive-engine built in the United States to run on a railroad. She was first called the 'Best Friend,' but having her boiler burst in June, 1831, and renewed in Charleston, she was afterward called the 'Phœnix.' This engine was built according to the plan and under the personal direction of our talented and enterprising fellow-citizen E. L. Miller, Esq."

At the time this engine was engaged, 1830, Mr. Miller led the van among the advocates of steam over horse or any other power for railroads. Public opinion was, at that time, much divided on the subject; the Baltimore and Ohio Railroad Company leaned in favor of horse-power; but, nothing daunted by the weight of their authority, Mr. Miller persevered, and, with an unyielding fixedness of purpose, proposed to construct an engine, on his own responsibility, equal to the best then in use in England. He succeeded, and to him belongs the honor of planning and constructing the "Best Friend," the *first locomotive ever built and worked* on a *railroad* in the United States.

The directors of the South Carolina Railroad, therefore, are not only entitled to the credit of having had

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built for their railroad, and run upon it, the first locomotive built in the United States, for the practical use of their road, but they are also entitled to the credit of being the pioneers in having their railroad the first, not only in America but the first in the world, constructed from the very beginning for the use of locomotive-power.

When the Baltimore and Ohio Railroad was commenced, nearly a year before, from the lack of experience and under the advice of the best English engineers, the track was designed and constructed for horse-power, and not until it had been built as far as Ellicott's Mills, a distance of thirteen miles, did the subject of locomotives come under deliberation; as Mr. Peter Cooper states in his letter to the author: "The road, in the opinion of the largest stockholders, was considered ruined for locomotives, which at that time began to show some signs of advancement and improvement in England, and they refused, in many instances, to advance another dollar toward its completion;" when Mr. Cooper's little locomotive, the "Tom Thumb," demonstrated the fact that, although the road was really built for horse-power, locomotives could be run upon it successfully. But with the Charleston Railroad directors there was no such doubt. At the first meeting of the board, the chief engineer of the road, Horatio Allen, made his able report on the kind of power the road should be constructed to sustain, and this report was followed by that memorable resolution of Mr. Bennett that it should be built for locomotive-power; and this resolution was unanimously adopted and acted upon in the contract with Mr. Miller to furnish a locomotive.

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CHAPTER XXXI.

FIRST LOCOMOTIVE-ENGINEER.

We have mentioned the name of Mr. Nicholas W. Darrell (whose likeness is herewith presented) as the first engineer of the two first-built locomotives in America; and we are also indebted to him for the descriptions and the sketches of these pioneer machines for railroad usefulness, the "Best Friend, of Charleston," and the "West Point."

A few months only after we received from Mr. Darrell's own hand these letters of description and sketches, the old veteran in railroad service, from his age and infirmities, yielded up his spirit to the God that gave it, and died in Charleston, the place of his nativity, and of his long career of usefulness, on the 4th of December, 1869, beloved and regretted by all who knew him.

In December, 1830, Mr. Darrell stood upon the platform of the "Best Friend" as its engineer. What imagination could then have conceived any thing like our present system of railroads, covering a continent with a net-work of iron stretching out its arms from the Atlantic to the Pacific? Yet, at that very time and place, 1830, at Charleston, existed one of the small beginnings. The man who helped to give the initial impulse to the wheels of locomotion has recently departed this life, beloved and respected by a large circle of friends and acquaintances, but almost unknown to the public; yet, in Charleston, he was known and appreciated. His body was attended to its last resting-place by the entire force of officials and employés of the South Carolina

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N. W. DARRELL.

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Railroad Company, and numerous friends, and the workshops were closed in token of respect for the first locomotive-engineer in America.

The following statement is from the *Charleston Courier*, January 1, 1870. It without doubt will be read with a great deal of interest, especially by locomotive-engineers of the present generation.

"'HONOR TO WHOM HONOR IS DUE.'—Nicholas W. Darrell, and the first American-built locomotive.

"In the November number of the *Rural Carolinian*, the first credit was given to Mr. Darrell, as being the engineer of the 'Best Friend,' the first American-built locomotive, which engine was brought out to this city in the latter part of December, 1830."

This article was copied into the New York *Scientific American*. Subsequently, No. 23 of the same has the following editorial:

"The first man who had charge of a locomotive in the United States turns out to be not Nicholas W. Darrell, as stated on page 325, current volume, in an article copied from the *Rural Carolinian*, but John Degnon, 48 First Street, New York. We had the pleasure of a call from Mr. Degnon, a few days since, and he explained to us that he was the man who took charge of the 'Best Friend' on its way to Charleston, and that he run this locomotive three months, or thereabouts, meanwhile giving Mr. Darrell the necessary instructions to qualify him for the post. The following year he executed a similar commission with a second locomotive. In proof of his statements, Mr. Degnon referred us to Horatio Allen and other prominent engineers and manufacturers of this city. 'Honor to whom honor is due!'"

The first article in the *Scientific American* the author read with great interest; but, on seeing the second article in the same journal, he was no less surprised than embarrassed, for he thought he had established the claim of Mr. Darrell beyond the possibility of a doubt. He immediately addressed a letter to Mr.

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John Degnon, No. 48 First Street. At the same time he addressed a letter to a friend in Charleston, requesting him to institute the strictest inquiries into the subject. To the first letter to New York, the author received in reply a letter from James H. Degnon, the son of the aforesaid John Degnon, informing the author that his father had but a few days before breathed his last, and that he would procure all the information upon his father's mission, with the necessary vouchers from the best authorities, to establish his claim to the honor of being the first engineer in reference to the "Best Friend." Two years have passed away, but not one line from young Degnon, to substantiate his father's claim, has come to hand. Meanwhile, thanks to the author's friend in Charleston, and unfortunately for Mr. Degnon, there is still another living witness, in the person of Julius D. Petsch, Esq., who will speak for himself. Mr. Petsch is probably the oldest machinist in our country. He was connected, as "chief mechanical superintendent," with the South Carolina Railroad, under its most successful administration, and is still. We would like to know upon what railroad Mr. Degnon gained his experience, in those early days of railroads, to be able to teach any person how to run a locomotive.

The following is Mr. Petsch's statement to the author:

"Dear Sir:

"I noticed an article in the *Rural Carolinian*, in reference to Mr. Nicholas W. Darrell being the first engineer of the locomotive 'Best Friend,' and fully substantiate what is there narrated. I have subsequently seen an article in the *Scientific American*, in which a Mr. Degnon, claims being the first man who run the engine 'Best Friend,' and instructed Mr. Darrell for three months, which statement is entirely incorrect. I will give the history of the 'Best Friend' in as few words as possible, which is as follows:

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Mr. E. L. Miller, who contracted with the South Carolina Railroad Company to furnish them with a locomotive suitable for their road, was behind time in its delivery. His excuse for being so was, that he could get no one at that season of the year to come out South with the engine, and, as there was no one in Charleston competent to put the engine together, he was forced to delay the shipment of it until late in the season, when he would be able to bring a competent person with him to erect the same. This letter of Mr. Miller's was at the time published in the daily papers of Charleston. He, however, brought the engine to Charleston, without his competent man, and called upon Mr. Thomas Dotterer to give him assistance in putting it upon the road. I was at that time foreman of Mr. Dotterer's establishment, and was requested by him to undertake the job. I at first declined, on account of Mr. Miller's published letter; but, to please Mr. Dotterer, at last consented. I took Mr. Darrell, who, like myself, had served his apprenticeship with Mr. Dotterer, and was just out of his time, to assist me. After erecting and putting the engine on the road, I ran it for three or four days, having Mr. Darrell with me all the time, then turned her over to him as engineer, in which capacity he continued until it exploded its boiler. I might mention that, previous to its explosion, Mr. Dotterer had cast and put under her (under my superintendence) a pair of new driving-wheels, in place of the original, which were made of wood, and which gave out after running about a week or ten days."

"The second engine was called the 'West Point,' and was built at the establishment of that name in New York, where the 'Best Friend' was also built. Mr. Darrell ran the 'West Point' while the 'Best Friend' was being rebuilt. The third engine was the 'South Carolina,' an eight-wheel engine, built at the same establishment, on a plan furnished by Mr. Horatio Allen, chief engineer of the road, and was the first eight-wheel engine ever built. Mr. Degnon came out with that engine on the part of the West Point company, and superintended its erection. After he left, I gave her in charge of Mr. Darrell. So you will perceive that, so far from Mr. Degnon running the 'Best Friend' and teaching Mr. Darrell, he did not come to Charleston until after Mr. Darrell had run the 'Best Friend' until her explosion, and had been transferred to the second engine, the 'West Point,' and had run it for months. You are aware that, from the time of putting cast-iron drivers under the 'Best Friend' until the completion of the road, I had charge of

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the machinery department of the South Carolina Railroad. Mr. Horatio Allen, and Mr. D. Arnold, his assistant, can vouch for the facts above stated. You are welcome to make any use you may think proper of this communication and vindication of Mr. Darrell's claim of being the first locomotive-runner on the South Carolina Railroad Company, which was in 1830.

"Yours truly,

"J. D. PETSCH."

CHAPTER XXXII.

HORATIO ALLEN'S LETTER.

WE will now close our history of the first and second American-built locomotives, by giving in this place Horatio Allen's communication to the author on several points of interest, to which we have alluded in the preceding pages. Mr. Allen's letter is as follows:

"NEW YORK, *March* 1, 1869.

"MR. WILLIAM H. BROWN—

"DEAR SIR: You ask me for some incidents in the early history of railroads and locomotives in this country, of which I have personal knowledge.

"Being one of the first of American engineers who gave attention to the subject, at the time when the indications were that a new era in intercommunication was about to open, and having visited England to obtain the information that existed at that time, and having given special attention to what was to be, and proved to be, the vital element of the new era—the locomotive—I, of necessity, was a party to many events of interest at this day. It has always been my intention to place on record some of the earlier incidents; but the postponement to a more convenient time, which the business engagements of life have led to, will leave this intention unfulfilled.

"At your request, and, as you say, it may be of some value to you personally, I will briefly refer to one or two events of the

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character of that contained in the quotation sent me. The quotation is from remarks made by me at the opening of the New York and Erie Railroad in 1852.

"It is often and, perhaps, generally thought that the railroad system was imported full grown. Such is not the fact, and it would greatly interest many Americans to have presented the part that was taken in this country in the development of this great instrumentality of modern times. I have not the time to present it, but I will refer to one or two events. One was the running of the first locomotive on a railroad on this continent. Herewith I send the remarks made by me at the opening of the New York and Erie Railroad, to which I will only add, that the locomotive was built under my directions in England, set up and run as described in 1829.

"The first decision in the world to build a railroad expressly for locomotive-power, for general freight and passenger business, was in this country, and at a period of time which gives especial interest to that decision. In the year 1829, it was my duty, as chief engineer of the South Carolina Railroad, to report to the directors as to the plan of construction of that work, in length one hundred and thirty-five miles.

"At that time, the question of motive power was in the following position: In England, the Liverpool and Manchester company had referred the question of motive-power to a commission of two engineers of great eminence, James Walker, of London, and John W. Rastrick, of Stone Bridge. These gentlemen, after a thorough examination of the whole subject, united in an elaborate report, accompanied by maps, etc., showing how the system recommended was to be carried out, and that system was a series of stationary engines, placed one to three miles apart, which, through long ropes, were to draw the trains from one engine to the other.

"On this side the water, the Baltimore and Ohio Railroad Company had sixteen miles in operation by horse-power. By correspondence with the gentlemen who had the beginning of that great enterprise in hand, I was informed that they were advised by English engineers, consulted on the subject, to build their road for horse-power.

"At this time, and with this intimation before me, I made my report to the directors of the South Carolina Railroad Company. In that report I made such comparison between horse-power and locomotive-power as the information at the time enabled me to

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make. I presented my conclusion that the comparison was in favor of locomotive-power, and I based my recommendation, that the road should be built for locomotive-power, essentially on the ground that there was no reason to believe that the breed of horses would be materially improved, but that the present breed of locomotives was to furnish a power of which no one knew its limit, and which would far exceed its present performances. At the meeting where this report was submitted, the directors, before they left their seats, passed the resolution unanimously that the South Carolina Railroad should be built solely for locomotive-power.

"To one other circumstance in connection with the same road I will refer. I had early come to the conclusion that to make the locomotive the instrument that would be required, it must furnish more power in one instrument and one engineer; that it was plain that the materials, and that, too, of the road which carried the locomotive, limited the weight to rest under each wheel, and that, as more power required more weight, there must, of necessity, be more wheels, and that, if more wheels are required, power must be made in reference to curves and change of grade. In reports made in 1830–'31, I set forth the combinations by which such provision could be made. At that time the locomotives in England were all on four wheels, and it was maintained by a strong English influence that it was not for us, in America, to depart from English usage. The subject was matter of discussion for a winter. I took the position (English usage to the contrary notwithstanding) that no long road for general passenger and freight purposes could maintain itself without the use of eight-wheel locomotives, and that probably ten-wheel locomotives would also be found desirable. Experience has amply sustained my position. My efforts were successful, and in 1831 the first eight-wheel locomotives were built on my plans and under my direction. The combinations by which provision was made for curves and changes of grade are substantially those so generally used on eight-wheel locomotives and eight-wheel passenger-cars.

"It is of some interest that their introduction, without patent, was in a great degree the means of saving the railroad companies and the public from charges for their use.

"It is with difficulty that I have found time to put on paper, in this brief way, this reply to your inquiries.

"Yours respectfully,

"HORATIO ALLEN.

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CHAPTER XXXIII.

CLAIMS TO FIRST LOCOMOTIVES.

In previous pages the author has stated that he was mainly induced to compile this history in consequence of the numerous statements in the public journals, giving what they supposed to be correct accounts or histories of the first locomotive built and run upon a railroad in the United States, and his desire to settle that much-disputed question of the first locomotive that was in the actual service of a company. The following from the Philadelphia *Public Ledger*, of January 18, 1869, is a sample of those statements which have, from time to time, been spread before the public, as the true history of the first locomotive. Since this statement was published in the *Ledger*, the author has been frequently told that the first American locomotive was built in Philadelphia, and run upon the Germantown and Morristown Railroad, in 1832. The communication in the *Ledger* reads thus:

"The first really effective locomotive in America," says Mr. Haskell, in the *Coachmaker's Journal*, "was built in Philadelphia, from a draught by Rufus Tyler, a brother-in-law of the late Matthias Baldwin, of Philadelphia. Messrs. Tyler & Baldwin had formed a co-partnership and entered into business at the corner of Sixth and Miner Streets, Philadelphia, where the plans and patterns were made and the building of the iron horse commenced. In consequence of a misunderstanding, the partnership was dissolved, and Mr. Baldwin continued the business, removing to a shop in Lodge Alley, where the engine was completed. Mr. Tyler was at that time considered the best mechanic in America. The wheels of the engine were made of wood, with broad rims and thick tires, the flange being bolted on the side. It was called 'Old Ironsides,'

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and was built in 1832. At eight o'clock in the morning, she was first put in motion on the Germantown and Morristown Railroad at their depot, Ninth and Greene Streets. She ran a mile an hour, and was considered the wonder of the day. On trial, it was ascertained that the wheels were too light to draw the tender, and to obviate this difficulty we had the tender placed in front of the engine, which kept the wheels on the track. Mr. Baldwin, the machinist, and myself, pushed the engine ahead, until we obtained some speed, when we all jumped on the engine, our weight keeping the wheels from slipping on the track. The boiler being too small for the engine, steam was only generated fast enough to keep the engine in motion a short time, so that we were compelled to alternately push and ride until we arrived at Germantown depot, where we rested and took some refreshments at the expense of the hotel-keeper at that place.

"At four o'clock we started on our return to Philadelphia, alternately riding and pushing in the same manner that we had come. Upon arriving at a turn on the road, at the up-grade, the engine suddenly stopped, when, upon examination, it was found that the connecting pipe between the water-tank and the boiler had been frozen, and the steam was all out of the boiler. It was then about eight o'clock, and was growing each moment colder. 'Necessity knows no law,' and so, after a short consultation, we made a summary appropriation of sundry panels of a post-and-rail fence close to the track, and started a fire underneath the pipe to thaw it. In a short time thereafter we had steam up and resumed our journey toward Philadelphia, arriving at the depot about eleven o'clock. Several successive trials were made during the following year; after each, Mr. Baldwin added improvements and made alterations in the machinery. In about a year it was found that the grease had saturated the hubs and loosened the spokes, and they finally went to pieces, and were replaced by new ones. This same engine is still in existence in Vermont."

When the author read this description in the *Ledger*, with the astounding caption that preceded it, viz., "The first really effective engine in America," he could not restrain his wonder. His surprise was only increased when he tried to imagine what the editor could be thinking about when he suffered such a communication

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to enter the columns of his valuable journal. When the author tried to imagine the appearance of this excursion-party to and from Germantown—first pushing awhile, then jumping on for a ride, then off again for another push, and on again for another ride—he was forcibly reminded of a scene he has often witnessed after the boss and his hands, on a railroad division, had knocked off for dinner, when a parcel of school-boys amused themselves with a ride upon the unoccupied hand-car.

If Philadelphia will claim this specimen of a locomotive as her share in the enterprise of introducing this indispensable machine into the United States, and as late as 1832, she is welcome to enjoy it; and her mechanics may be justly proud of their handiwork; for they had certainly made no improvement upon the English locomotives, several of which were at that time (December, 1832) in this country; besides the fact that there had been built in this country, between the years 1829 and '31, one most successful experimental locomotive by Mr. Peter Cooper, of New York, which we describe in full, and also there had been built in 1830 and '31 several American locomotives for actual railroad service, which were in successful operation, as we have already shown, viz., the "Best Friend" and the "West Point," for the Charleston Railroad. Another article upon the subject of early locomotives, or rather, as it is headed, "The first train of cars by steam in America," we read in the *Boston Advertiser* of January, 1869, as follows:

"The First Steam-train in America."—In the superintendent's office at the Providence Railroad Station, in this city, is a picture of the first steam railroad train in America, run from Albany to Schenectady, over the Mohawk and Hudson Railroad, in

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1831. The train consisted of a locomotive, tender, and two cars. The locomotive, named the 'John Bull,' and imported from England, was of very simple and uncouth construction, and might be mistaken in these days for a pile-driver. Its cylinders were five and a half inches in diameter, and sixteen inches' stroke, and the connecting-rods worked on double cranks on the front axle. It weighed four tons. John Hampson, an Englishman, was the engineer. The tender was a simple frame, with a platform, upon which were placed a heap of wood used for fuel, and two crates filled with similar combustibles. This vehicle had also a passenger-box in the rear. The cars were patterned after the old stage-coaches, resembling somewhat the railroad-coaches still used in England, and were coupled with three links instead of one, as at present. Twelve passengers occupied the inside seats, and three were seated outside. Among them were Mr. Thurlow Weed and ex-Governor Yates. Their portraits, and those of their fellow-passengers, which the picture gives in sombre and sharply-defined *silhouette*, would readily be recognized by any one acquainted with them when they made the excursion. The picture is photographed by Messrs. J. L. Howard & Co., of Springfield, from the original, in the possession of the Connecticut Historical Society."

The original picture of the engine and train of cars, from which the photograph just described was taken, was executed by the author of this history, and presented by him to the Connecticut Historical Society at Hartford. This photograph copy has since been lithographed for Thomas Jarmy, at the lithographic establishment of Sage & Son, Buffalo, in 1865.

The original picture, presented by the author to the Connecticut Historical Society, was done on the very day the engine made its first trip with a train of cars. Attached to this lithograph Mr. Jarmy has given a kind of history of the machine, as follows: "View of the first American railroad train, as it appeared ready for starting, on the Mohawk and Hudson Railway, the first part of the New York Central Railroad from Albany to Schenectady, about the 31st of July, 1832, executed at

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the time on black paper with a pair of scissors, by a Mr. Brown, of Pennsylvania, and lithographed from a photograph of the original picture in the possession of the Connecticut Historical Society." Mr. Jarmy also goes on to describe and name the passengers in the cars, and gives the cost and charges of the importation of the engine at the custom-house, New York, and the date, November 12, 1831, as the freight of said locomotive, the "John Bull," per schooner Eclipse, from New York to Albany. With regard to this lithograph, which, no doubt, many railroad men look upon as authentic, the author will say that, so far as the representation of the engine and train of cars, together with the passengers, is concerned, the copy really is correct, nor can the author complain at his name being given as the artist who took the original sketch in the Connecticut Historical Society rooms; but the public should be informed of the utter inaccuracy in the historical portion of the lithographic copy. The locomotive drawn by the author on that occasion was not the English engine, "John Bull," as Mr. Jarmy represents, but the American-built locomotive "De Witt Clinton." It was sketched on the 9th day of August, 1831, the day of the first excursion-trip with a train of cars attached. Several experiments during the previous month of July had been made with different kinds of fuel, to discover that which would be best suited for its use.

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CHAPTER XXXIV.

FIRST LOCOMOTIVE IN NEW YORK.

This locomotive, the "De Witt Clinton," stood upon the track already fired up, and with a train of some five or six passenger-coaches attached to it (two only were represented in our sketch, for want of room.) These passenger-coaches were of the old-fashioned stage-coach pattern, with a driver's seat or box upon either end outside. They had hitherto been used upon the road for passengers, and drawn by horse-power. At this early day when the road was just built, passengers took a car at the foot of the inclined plane in Albany, and were drawn up by a stationary engine to the top of the hill where the regular track commenced. Horses were then hitched to the cars and proceeded to the other end of the road, where another inclined plane, not then built, but soon after completed, with a stationary engine, lowered the cars into Schenectady. (Both these planes are now removed.) On arriving at the top of the plane at Albany on this memorable occasion, the engine and train were seen standing upon the track. The peculiar appearance of the machine and train (the first ever seen by the author) arrested his attention, and he at once resolved to make a sketch of the singular-looking affair and its equally singular-looking appendages. Drawing from his pocket a letter just received of a few lines only, written upon a whole sheet of paper (no envelopes were used at that day), and substituting his hat for a desk, he commenced his sketch of the unique machine standing before him. Meantime the excursionists were entering the cars, and the author had taken a hasty, rough draw-

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ing of the machine, the tender, the individual standing on the platform of the machine as its engineer, and the shape of the first passenger-coach, when a tin horn was sounded and the word was given, "All aboard," by Mr. John T. Clark, the master of transportation, who acted as conductor on that memorable occasion. No such officer as a conductor had been required upon a railroad before locomotives and long trains of cars were adopted. Before this event, in place of conductors, the drivers of the single-horse cars collected the tickets or fare, as omnibus-drivers do at the present time.

On this occasion, the two first cars, or coaches, as they were then called, and the third also, were just as the two are represented in our sketch. The remainder of the cars on the train were surmounted with seats made of rough plank to accommodate the vast crowd of anxious expectants assembled to witness the experiment and participate in this first ride on a railroad train drawn by a locomotive. The cars were crowded inside and outside; not an available position was unoccupied. Two persons stood ready for every place where one could be accommodated, and the train started on its route, leaving hundreds of the disappointed standing around.

As there were no coverings or awnings to protect the deck-passengers upon the tops of the cars from the sun, the smoke, and the sparks, and as it was in the hot season of the year, the combustible nature of their garments, summer coats, straw hats, and umbrellas, soon became apparent, and a ludicrous scene was enacted among the outside excursionists before the train had run the first two miles.

The author was an inside passenger on that ever-memorable occasion. We say memorable, for it was one never to be forgotten. It was on the 9th day of

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August, 1831, when what was represented and known to be the first American locomotive ever run upon a railroad in the State of New York. Thus the sketch in our work, representing a locomotive, tender, and two passenger-cars attached, is, as we before stated, a truthful representation of one of the first railroad trains in America, and the very first run in the State of New York, and followed soon after the last successful locomotive experiments by Mr. Peter Cooper on the Baltimore and Ohio Railroad, and the advent of the first American-built locomotives for actual service upon the Charleston and Hamburg Railroad, in South Carolina. It was the third locomotive built in America for actual service. This engine was named the "De Witt Clinton," and is thus described by Mr. David Matthew, in his letter to the author in 1859:

"American engine No. 3 was called the 'De Witt Clinton.' It was contracted for by John B. Jervis, Esq., at the West Point Foundery, and was commenced by me to fit up in April, 1831, soon after the engines 'Best Friend' and 'West Point' were completed and forwarded to Charleston.

"I left New York with the 'De Witt' on the 25th of June, 1831, and had steam on to commence running in one week from that time. The 'De Witt' had two cylinders five and a half inches in diameter and sixteen inches' stroke; four wheels, all drivers, four and a half feet diameter, with all the spokes turned and finished. The spokes were wrought-iron, hubs cast-iron, and the wheels tired with wrought-iron, inside crank and outside connecting-rods to connect all four wheels; a tubular boiler with drop furnace, two fire-doors, one above the other; copper tubes two and a half inches in diameter and about six feet long; cylinders on an incline, and the pumps worked vertically by bell-crank. This engine weighed about three and a half tons without water, and would run thirty miles an hour with three to five cars on a level, with anthracite coal, and was the first engine run in the State of New York on a railroad."

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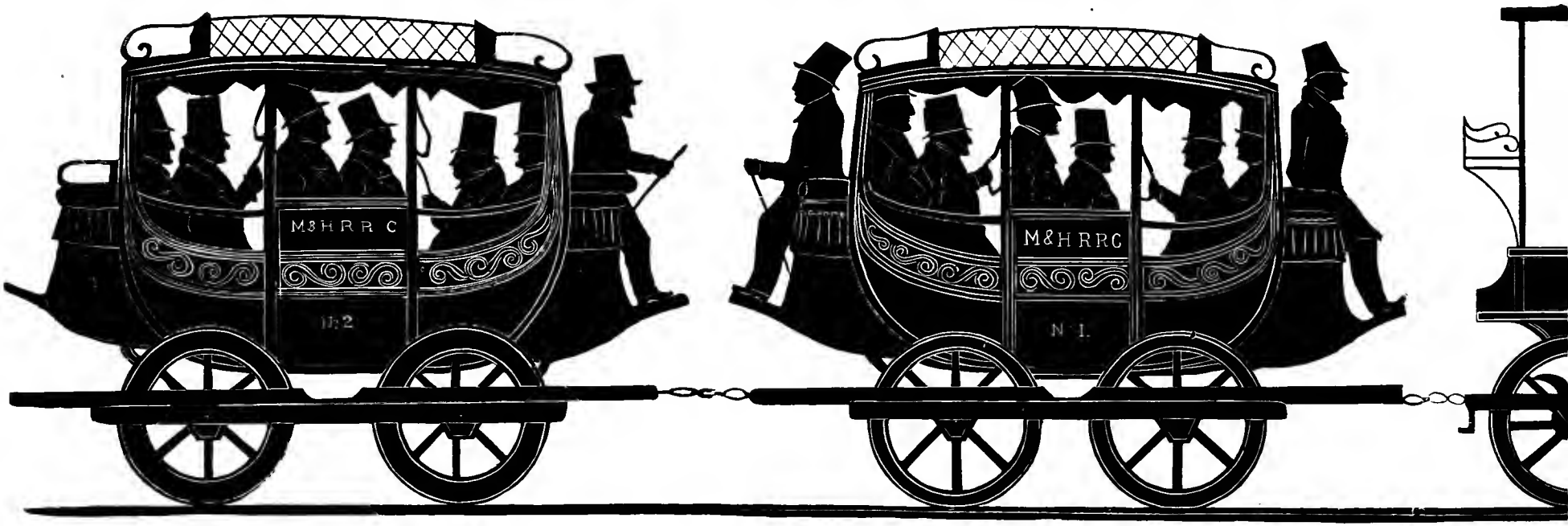
THE FIRST LOCOMOTIVE AND TRAIN OF PASSENGER-CARS I

The American Locomotive "De Witt Clinton," Mr. D



The locomotive "De Witt Clinton" was ordered by John B. Jervis, chief engineer of the Mohawk and Hudson Railroad, and was the third locomotive built in Ame taken to Albany in the latter part of June, 1831, and was put upon the road and run by David Matthew. The first experimental trial-trip was made on the 5th of Jul from Albany to Schenectady on August 9, 1831, on which occasion the author of this History of the Early Locomotives in America rode in one of the cars (only the fir nounced a truthful representation of the locomotive, tender, and the first two of the number of cars in the train, and correct likenesses of the engineer and passengers rep of black paper with a pair of scissors, a peculiar art with which the author was gifted from his earliest boyhood. The original picture was presented by the author to valued for its antiquity and truthfulness. The names of the engineer and passengers are as follows, commencing at the engine: David Matthew, engineer; first c Mr. Van Zant, Billy Winne, penny postman; second car, John Townsend, Esq., Major Meigs, old Hays, High-Constable of New York, Mr. Dudley, Jos. Alexander, of t time they were taken—forty years ago. The outside seats were for the drivers when these cars had been drawn by horse-power, but on this occasion were occupied by t

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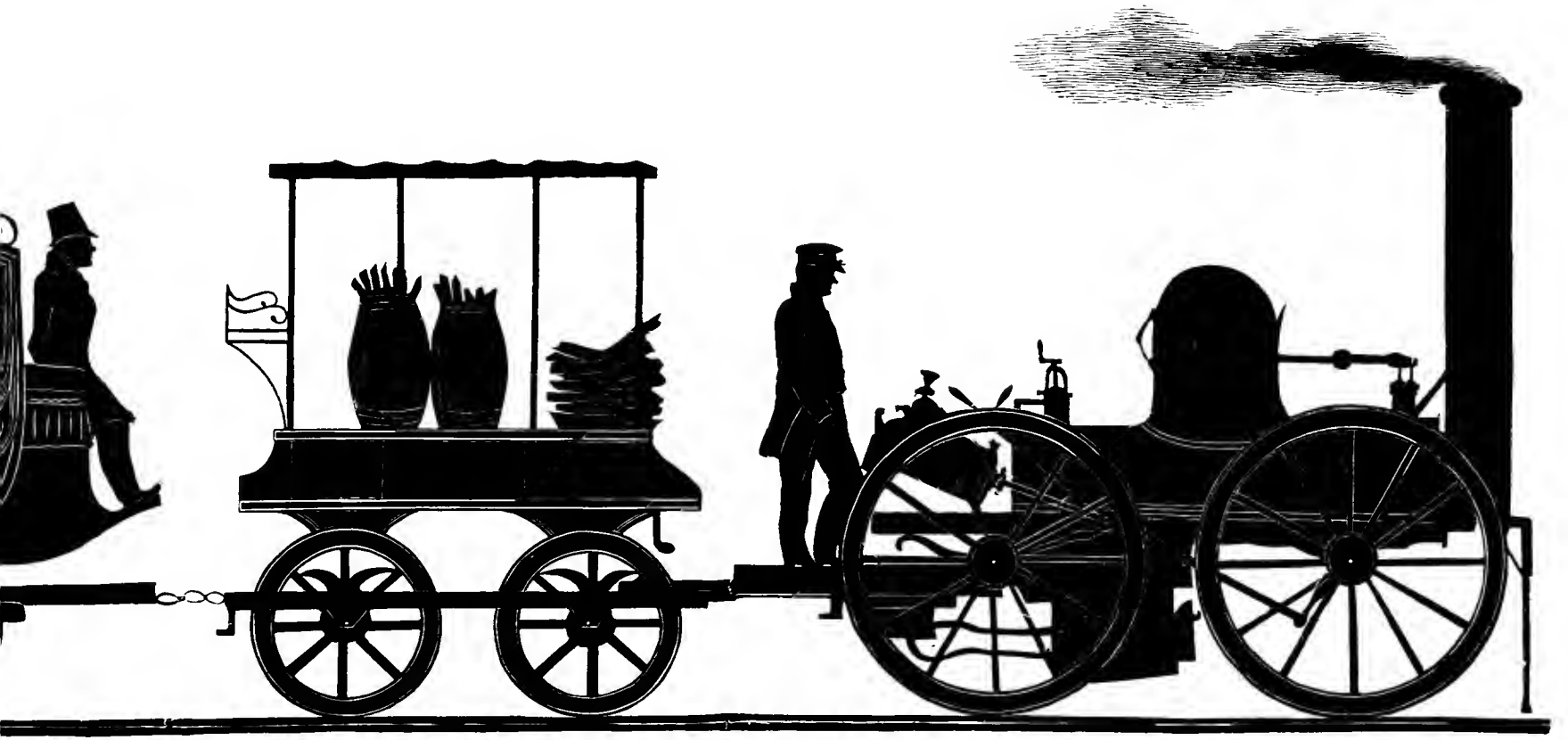
NGER-CARS EVER RUN IN THE STATE OF NEW YORK.

T CLINTON," Mr. DAVID MATTHEW, Engineer.



he third locomotive built in America for actual service upon a railroad. The machine was made at the West Point Foundery Works in New York, l-trip was made on the 5th of July, and others at different times during that month. The first excursion-trip, with a train of passenger-cars, was made de in one of the cars (only the first two are represented above), and before the train started made the sketch as it appears above, which was pro- the engineer and passengers represented in the cars. Some of them are yet living, as their letters in this work will show. The picture was cut out was presented by the author to the Connecticut Historical Society; it was about six feet in length, and is yet preserved by the society and highly David Matthew, engineer; first car, Erastus Corning, Esq., Mr. Lansing, ex-Governor Yates, J. J. Boyd, Esq., Thurlow Weed, Esq., Mr. John Miller, Mr. Dudley, Jos. Alexander, of the Commercial Bank, Lewis Benedict, Esq., and J. J. Degraft. These likenesses were all readily recognized at the this occasion were occupied by the excursionists.

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On this first excursion, on the 9th day of August, 1831, as no such officer as a conductor had been required upon the road, where hitherto no connected train of cars had been run, but where each driver officiated as collector of fares, Mr. John T. Clark, as the first passenger railroad conductor in the North, stepping from platform to platform outside the cars, collected the tickets which had been sold at hotels and other places through the city. When he finished his tour, he mounted upon the tender attached to the engine, and, sitting upon the little buggy-seat, as represented in our sketch, he gave the signal with a tin horn, and the train started on its way. But how shall we describe that start, my readers? It was not that quiet, imperceptible motion which characterizes the first impulsive movements of the passenger-engines of the present day. Not so. There came a sudden jerk, that bounded the sitters from their places, to the great detriment of their high-top fashionable beavers, from the close proximity to the roofs of the cars. This first jerk being over, the engine proceeded on its route with considerable velocity for those times, when compared with stage-coaches, until it arrived at a water-station, when it suddenly brought up with jerk No. 2, to the further amusement of some of the excursionists. Mr. Clark retained his elevated seat, thanking his stars for its close proximity to the tall smoke-pipe of the machine, in allowing the smoke and sparks to pass over his head. At the water-station a short stop was made, and a successful experiment tried, to remedy the unpleasant jerks. A plan was soon hit upon and put into execution. The three links in the couplings of the cars were stretched to their utmost tension, a rail, from a fence in the neighborhood, was placed between each pair of cars and made fast by means

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of the packing-yarn for the cylinders, a bountiful supply being on hand (as the present brass-ring substitute had not then been invented). This arrangement improved the order of things, and it was found to answer the purpose, when the signal was again given, and the engine started.

In a short time the engine (after frightening the horses attached to all sorts of vehicles filled with the people from the surrounding country, or congregated all along at every available position near the road, to get a view of the singular-looking machine and its long train of cars; after causing thus innumerable capsizes and smash-ups of the vehicles and the tumbling of the spectators in every direction to the right and left) arrived at the head of the inclined plane at Schenectady, amid the cheers and welcomes of thousands, assembled to witness the arrival of the iron horse and its living freight.

After some time passed in the ancient city of Schenectady, and ample refreshments had been afforded, the word was given by conductor Clark to prepare for the return. The excursionists resumed their seats, and in due time, without any accident or delay, the train arrived at the point from which it had first started, the head of the inclined plane at Albany. The passengers were pleased with the adventures of the day, and no rueful countenances were to be seen, excepting occasionally when one encountered in his walks in the city a former driver of the horse-cars, who saw that the grave had that day been dug, and the end of horse-power was at hand.

After the return to Albany, the author made a clean copy from his rough sketch of the engine "De Witt Clinton," and also the likeness of the engineer of

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the day, Mr. David Matthew, who controlled its movements on this memorable first occasion. As the tin horn sounded the signal for starting, just as the author had sketched the shape of the first of the passenger-cars in the train, he supplied the place of passengers with the likeness of several of the old citizens of Albany. Hence the appearance of Mr. Thurlow Weed, ex-Governor Yates, and others, as named in the article from the *Boston Advertiser*. This original picture, as we have before stated, was presented to the Connecticut Historical Society by the author. It has since been photographed by J. L. Howard & Company, of Hartford, and from this photograph the copy in lithograph by Sage & Son was taken; but the engine is there erroneously called an English machine, the "John Bull," and John Hampson, an Englishman, is said to have been the engineer. A second copy of this sketch, calculated to mislead the public, has just been circulated by a firm in Boston, called the Antique Publishing Company, 75 Haverhill Street, and copyrighted in 1870. This picture, like the one by Sage & Son, is taken from the same photograph of the author's original sketch in the Hartford Institute, and in its history, like the other, purports to be a likeness of the English locomotive "John Bull," and an Englishman, John Hampson, the engineer. In this volume we shall furnish the evidence to show that the original picture in the Connecticut Historical Society Rooms was a true representation of the American locomotive "De Witt Clinton," the third American locomotive built for actual service, and the first American-built locomotive run in the State of New York; Sage & Son, and the Boston Antique Publishing Company, to the contrary notwithstanding.

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CHAPTER XXXV.

FURTHER EVIDENCES.

THE following letter is from Mr. David Matthew. It is further evidence that the "De Witt Clinton," and not an English engine, was the first one to run on the road from Albany to Schenectady, in August, 1831:

"PHILADELPHIA, *February* 13, 1860.

"WILLIAM H. BROWN, ESQ.—

"DEAR SIR: Yours of January 17th is at hand. Having been absent, my reply has been delayed until this date. I will endeavor to answer your several questions as correctly as I possibly can, in the absence of records.

"*First.* I did run the 'De Witt Clinton,' on the 9th day of August, 1831, and every day that it run from the 2d day of July, when first put on the road, to December 1, 1831.

"*Second.* There was no English-built engine upon the road, until the 'Robert Fulton,' made by Stephenson, arrived, which was about the last of August. About the middle of September it was tried on the road, and commenced regular trips soon after. On the excursion-trip in September, the Fulton was assigned to haul the train, but something got wrong about the supply-pipe, and my engine, the 'De Witt Clinton,' was called out for that duty, and did it well.

"*Third.* I did know John Hampson and Adam Robinson. John Hampson was my assistant. He left West Point Foundery with me, and when the 'Robert Fulton' arrived and was placed on the road, he took her to run. Adam Robinson became my fireman on the 'De Witt Clinton' when we began to make regular trips.

"When the 'John Bull' came out, nearly a year afterward, John Hampson took her to run. Both of these men are now dead. John Hampson left the Mohawk and Hudson Railroad early in 1832. He brought the second engine from New York that was run on the Germantown and Philadelphia Railroad. He next took the 'Davy Crocket' to the Saratoga Railroad; then took charge of the Camden and Amboy Railroad machine-shops at Borden-

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town. Thence he went to the New Orleans and Carrollton Railroad, on a salary of five thousand dollars per year, where he remained several years.

"Adam Robinson was killed by accident on a railroad.

"Will you please procure and send to me one of the drawings, or photographs, from the original picture you took in Albany, of the old 'De Witt Clinton' and train of cars? I saw the original picture at your room in Albany, and was forcibly struck by the accuracy of your likeness to the old machine, the cars, and the passengers, several of whom I knew well.

"If I can give you any other information, write to me at once, and I will try to be more prompt in my reply.

"Respectfully yours,

"DAVID MATTHEW,

"205 Pear Street, Philadelphia."

From the freight-bills, custom-house charges, etc., etc., attached by Sage & Son to their lithograph copy of a photograph of the original picture in the Hartford Institute, the author is inclined to believe that these refer to those made upon the first English locomotive for the Mohawk and Hudson Railroad, which was the "Robert Fulton." This machine, as we see in the following articles from the *Albany Argus* of that period, arrived by the ship Mary Howland, from Liverpool, early in September, 1831. In several articles of the *Argus*, in which this engine is spoken of, it is called the "John Bull." This was done in allusion to the country where it was made, in the same manner as the *Argus* also uses the words "Brother Jonathan" when speaking of the "De Witt Clinton." These *sobriquets* are familiarly applied and understood by every one when speaking of the natives of either country.

A locomotive named the "John Bull" came from England, subsequently, but not for nearly a year after the events we are now recording.

Messrs. Sage & Son give the following as the costs

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and charges as per invoice of locomotive-engine, per ship Mary Howland, from Liverpool, $3,763.67. Custom fees, $1,017.25. Freight-bills, September 18, 1831, $88.67.

The following extracts from the Albany *Argus* will clearly show that the West Point Foundery engine was the first to run upon the Mohawk and Hudson Railroad, and that no English locomotive was in existence upon that road until the "Robert Fulton," built by Stephenson, arrived about the last of August, and was put on the road the 16th or 17th of September after:

(*From the Albany Argus, July* 25, 1831.)

"MOHAWK AND HUDSON RAILROAD.—We travelled over part of this road on Saturday, which is ready to receive the cars on Monday next, the 1st of August, if not earlier. The road will be open from the head of Lydius Street to the brow of the hill at Schenectady, a distance of about twelve miles and a half, and travelling upon it will be forthwith commenced. We learn that the company have decided on using steam-power alone. The company will begin their operations with an engine from the West Point Foundery, which we understand will be placed on the road for service on Wednesday, the 27th, being precisely twelve months from the day the ceremony of breaking ground was performed last year.

"In less than a month the company expect from England one of Mr. Stephenson's engines, similar to those now in use on the Liverpool and Manchester Railway.

"The work, we have no doubt, will do credit to the skill of the engineer, John B. Jervis, Esq."

"MOHAWK AND HUDSON RAILROAD.—On Saturday this work was completed and prepared for the passage of the cars. On that day an experiment was made with the locomotive 'De Witt Clinton,' from the West Point Foundery, but, owing to some defect in the ignition of the Lackawanna coal, the speed did not at any time exceed six or seven miles an hour. On Saturday next, if the weather is favorable, the company propose to celebrate the completion of the work, so far, by inviting our citizens to a ride through the entire line."

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(*From the Albany Argus, August* 11, 1831.)

"MOHAWK AND HUDSON RAILROAD.—On Monday, August 9, 1831, the 'De Witt Clinton,' attached to a train of cars, passed over the road from plane to plane, to the delight of a large crowd assembled to witness the performance. The engine performed the entire route in less than one hour, including stoppages, and on a part of the road its speed was at the rate of thirty miles an hour."

(*From the Albany Argus, August* 27, 1831.)

MOHAWK AND HUDSON RAILROAD.—The company having received their locomotive from England by the Mary Howland, it will, we understand, be in operation on the road in the course of a few days. It is called the 'Robert Fulton.'"

(*From the Albany Argus, September* 8, 1831.)

"MOHAWK AND HUDSON RAILROAD.—Another trial was made on Thursday with the locomotive 'De Witt Clinton.' It performed the passage from Schenectady to this city in fifty minutes. Among the passengers was Brigadier-General Scott, of the United States Army."

(*From the Albany Argus, September* 9, 1831.)

"MOHAWK AND HUDSON RAILROAD.—The American locomotive 'De Witt Clinton' came down yesterday morning in forty-six minutes. The fuel was wood. A trial of the English locomotive will probably be made on Tuesday next. The power and weight of this engine are double those of the American engine."

(*From the Albany Argus, September* 19, 1831.)

"MOHAWK AND HUDSON RAILROAD.—Trials of the English locomotive were made on the 16th and 17th. They were, we understand, entirely successful, and particularly so with the use of anthracite coal. The engine was propelled with ease at the rate of from fifteen to twenty miles an hour, and will commence her regular trips this day."

The next we hear of the English locomotive, after the foregoing experiments, relates to transactions of the following week. The author was present, and remembers well every incident on that interesting occa-

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sion, as they are recorded in the *Argus*, and, had the English machine performed the duty which was assigned to her on that day, there is no doubt a sketch of her appearance would have found a place in our present volume. But the author did not "see it." The *Albany Argus*, September 26, 1831, says:

"RAILROAD EXCURSION.—On Saturday, September 24th, a numerous company, at the request of the president and directors of the Mohawk and Hudson Railroad Company, enjoyed a very gratifying ride upon the road. The company consisted of the Governor, Lieutenant-Governor, members of the Senate, now in session as a Court of Errors, our Senators in Congress, the Chancellor and Judges of the Supreme and District Courts, State officers, the president of the Board of Assistants and members of the Common Council of the city of New York, the Mayor, Recorder, and corporation of the city, and several citizens of New York, Albany, and Schenectady.

"Owing to a defect in one of the supply-pipes of the English locomotive, that powerful engine was not brought into service, and the party, having been delayed in consequence, did not leave the head of Lydius Street until nearly twelve o'clock. They then started with a train of ten cars, three drawn by the American locomotive 'De Witt Clinton,' and seven by a single horse each. The appearance of this fine cavalcade, if it may be so called, was highly imposing. The trip was performed by the locomotive in forty-six minutes, and by the cars drawn by horses in about an hour and a quarter. From the head of the plane, about a quarter of a mile from Schenectady, the company were conveyed in carriages to Davis's Hotel, where they were joined by several citizens of Schenectady, and partook of a dinner that reflected credit upon the proprietor of that well-known establishment. Among the toasts offered was one which has been verified to the letter, viz.: 'The Buffalo Railroad—may we soon breakfast in Utica, dine in Rochester, and sup with our friends on Lake Erie!' After dinner the company repaired to the head of the plane, and resumed their seats for the return to Albany. It was an imposing spectacle. It was a practical illustration of the great preference of this mode of travel and conveyance. The American locomotive started with a train of five cars, containing nineteen or twenty persons each,

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besides the tender, and never did 'Brother Jonathan,' as it was familiarly called, perform the trip in more beautiful style. It came down with its train in thirty-eight minutes, being at the rate of nineteen miles an hour, the last six miles were performed in fourteen minutes. The cavalcade with horses came down in sixty-eight minutes.

"'Brother Jonathan,' as it is familiarly called, is as yet decidedly in advance of 'John Bull.'"

We give the foregoing extracts from the *Argus* merely to prove more conclusively that the "De Witt Clinton" was the locomotive sketched by the author on the 9th day of August, and not an English engine, as some parties have represented. On neither of these excursions was the English locomotive in use. On the excursion of the 9th of August the English engine had not yet arrived, and on the excursion of the 24th of September her supply-pipe was not in order, and the American locomotive "De Witt Clinton" performed the duty successfully, as is recorded in the *Albany Argus* just quoted. It was on the occasion of the excursion on the 9th day of August, 1831, with the "De Witt Clinton," as mentioned in the article in the *Albany Argus* of August 11th, that the author made the sketch of the locomotive, the engineer, the tender, coaches, and passengers in the train, which was exhibited at his studio, and attracted great crowds for several weeks during his professional sojourn in Albany. This picture the author soon after presented to the Connecticut Historical Society, where it may be seen at the present time. In 1858 or '59 this original picture was photographed by J. L. Howard & Company, of Hartford, and a copy obtained by the author.

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CHAPTER XXXVI.

THE JUDGE'S FIRST RIDE.

Since this photograph has been in the possession of the author, he has been often asked why the engine and train are represented in the unique and sombre style in which they appear in profile, or black outline. To this inquiry he will reply by informing those who are not familiar with the facts, that, from his earliest recollection, he has been gifted with a rare and peculiar talent or faculty (entirely intuitive in him) of executing with wonderful facility and accuracy the outlines or form of any person or object from a single glance of the eye, and without any machinery whatever, but with a pair of common scissors and a piece of black paper.

This peculiar style of outline portraiture, or shaping exact resemblances of persons or objects with black paper, and commonly known as profiles, was invented, according to the elder Disraeli, in 1757, in Paris, and called by the French *silhouette*. In the author this faculty was not confined to shaping the mere outlines of persons or faces, but was extended to portraying entire family groups, military companies, fire companies with their engines and hose-carriages, sporting-scenes, race-courses, and marine views, representing a harbor and shipping. All were executed in black paper, and with a pair of scissors. Hence, in the same style he executed the above-mentioned likeness of the locomotive "De Witt Clinton," with the cars and passengers, and afterward presented the same to the Connecticut Historical Society. This rare and peculiar faculty or gift was so strongly developed in the author, that all objects, when once

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presented to the eye, are, as it were, photographed upon his brain, so much so, and with such indelibility, that it was not actually necessary for an individual to be present and stand for a likeness. A glance for a moment at an individual in some accustomed position or attitude only was necessary, and the likeness could be produced hours, days, weeks, and often years thereafter, entirely from memory alone.

The author, for several years, made a very lucrative business by the exercise of this peculiar faculty of taking likenesses, and during that time visited all the principal cities of the country. His first object on visiting a new field for the exercise of his art was to notice several prominent and well-known citizens as they walked upon the streets, and place their likenesses most accurately upon paper as evidences of his skill in this peculiar art and his wonderful memory of persons and forms.

It so happened that, on one of the author's professional visits to the city of Albany, that a trip, which was then supposed to be the first train of cars drawn by a locomotive in America, was run upon the Mohawk and Hudson Railroad. A graphic and particular description of this same first trip is given in a letter from a well-known and distinguished gentleman, now over eighty years of age, who is one of the few survivors. The letter is as follows:

"RIDGEWAY, PA., *June* 24, 1870.

"WILLIAM H. BROWN, ESQ.—

"DEAR SIR: Your note of the 21st inst., asking for my recollections of such incidents as impressed themselves on my mind in the ever-memorable first trip by locomotive-power from Albany to Schenectady in 1831, is before me. In the early part of the month of August of that year I left Philadelphia for Canandaigua,

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New York, travelling by stages and steamboats by way of New York to Albany. Stopping at the latter place with my friend J. M. Hughes, now of Cleveland, Ohio, I learned that a locomotive had arrived there, and that it would make its first trip over the road to Schenectady the next day. I concluded to lie over and gratify my curiosity with a first ride after a locomotive.

"That locomotive, the train of cars, together with the incidents of the day, made a very vivid impression on my mind. I can now look back from one of Pullman's palace-cars, over a period of forty years, and see that train, together with all the improvements that have been made in railroad travel since that time, for I have been a constant traveller for over half a century, and have observed the steady and constant progression in motive-power and railroad facilities up to the present time. And now, taking 1870 as a standpoint, looking back and forward forty years, who can say that the next forty years will not exceed the past in railroad intercommunication, and that Dr. Krumer's theory of using compressed air as a motive power may not, ere that, be brought into general use, and that the engineer will manage his whole train with the same facility and ease that the Mexican *caballero* starts, runs, and stops his horse?

"I am not machinist enough to give a description of the locomotive that drew us over the road that day, but recollect distinctly the general 'make-up' of the train. The sketch you showed me when I was last at your place, taken by you in your peculiar style, is very correct, and brings to my mind, as vividly as though only seen yesterday, the engine and train as it appeared on that never-to-be-forgotten occasion.

"The train was composed of coach-bodies, mostly from Thorpe & Sprague's stage-coaches, placed upon trucks. The trucks were coupled together with chains or chain-links, leaving from two to three feet slack, and when the locomotive started it took up the slack by jerks, with sufficient force to jerk the passengers, who sat on seats across the top of the coaches, out from under their hats, and in stopping they came together with such force as to send them flying from their seats.

"They used dry pitch-pine for fuel, and, there being no smoke or spark-catcher to the chimney or smoke-stack, a volume of black smoke, strongly impregnated with sparks, coals, and cinders, came pouring back the whole length of the train. Each of the outside passengers who had an umbrella raised it as a protection against

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the smoke and fire. They were found to be but a momentary protection, for I think in the first mile the last one went overboard, all having their covers burnt off from the frames, when a general *mêlée* took place among the deck-passengers, each whipping his neighbor to put out the fire. They presented a very motley appearance on arriving at the first station. There rails were procured and lashed between the trucks, taking the slack out of the coupling-chains, thereby affording us a more steady run to the top of the inclined plane at Schenectady.

"The incidents off the train were quite as striking as those on the train. A general notice having been given of the contemplated trip, excited not only the curiosity of those living along the line of the road, but those living remote from it, causing a large collection of people at all the intersecting roads along the line of the route. Everybody, together with his wife and all his children, came from a distance with all kinds of conveyances, being as ignorant of what was coming as their horses, drove up to the road as near as they could get, only looking for the best position to get a view of the train. As it approached, the horses took fright and wheeled, upsetting buggies, carriages, and wagons, and leaving for parts unknown to the passenger, if not to their owners, and it is not now positively known if some of them have yet stopped. Such is a hasty sketch of my recollection of my first ride after a locomotive.

"Hoping that your contemplated history of early locomotives in America may be appreciated by the reading public, and a pecuniary success to yourself,

"I remain truly yours,

"J. L. Gillis."

The writer of the foregoing letter, Judge Gillis, is a native of the State of New York, and is now eighty years of age. He served in the War of 1812, and was wounded at the battle of Lundy's Lane. He moved to Ridgeway, Pennsylvania, in 1822, then in Jefferson County, now the seat of justice of Elk County. He was an active member of the Masonic fraternity in the State of New York previous to his removal to Pennsylvania. Four years later, in 1826, when political anti-masonry

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took its rise in that State, in order to show the extent of the conspiracy for the abduction of one Morgan, a bill of indictment was procured against Judge Gillis and others at Canandaigua. As soon as he heard of such indictment, he returned to the State of New York and surrendered himself to the court and was placed under bonds of ten thousand dollars for his appearance at the next term. He visited that county nine terms of the court, the prosecutors putting the case off at each term. Finally, the trial came off in 1829, and he was acquitted, no evidence being found for conviction.* Judge Gillis has served his district in the House and Senate of the State Legislature and in Congress. He was an active and ardent supporter of internal improvement in the State of Pennsylvania, and one of the earliest advocates of the construction of the line of railroad from Philadelphia to Erie, which he supported until completed. He was appointed Judge of the Court of Jefferson County in 1843, and reappointed in 1844 as one of the first Judges of Elk County. In 1862 Judge Gillis removed to Mount Pleasant, Henry County, Iowa, where he now resides.

In 1859 the author, having quitted the profession of artist, was living in Huntingdon County, Pennsylvania, as an employé of the Huntingdon and Broad Top Railroad. Many years had passed away since he had thought of the "De Witt Clinton," when he received from an unknown hand a newspaper containing a paragraph marked with a pen to attract his attention. It revived in his memory his old picture of the "De Witt Clinton" and his visit to Hartford very many years before. The paragraph was as follows:

* It was some time during his trips to attend trial that Judge Gillis rode in the cars after a locomotive.

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"A RARE CURIOSITY.—We were this day shown by Mr. Bradley, Secretary of the Fort Wayne and Chicago Railroad, at Pittsburg, a photograph copy of the first American locomotive ever built in this country and run upon a railroad in the United States. The photograph was made from the original picture now in the Connecticut Historical Society, and was taken by a Mr. Brown in his peculiar style of art. It was cut out of black paper with a pair of common scissors. In the cars we recognize the likenesses of several of the old citizens of Albany, Thurlow Weed, Esq., ex-Governor Meigs, old Hays, of New York, the celebrated thief-catcher, and several others. The picture is executed with great skill and fidelity, and is a rare curiosity when compared with the locomotives and trains of the present day."

The author then determined to procure a copy of his old work, and applied to Mr. Bradley for information, which he obtained, and also to J. L. Howard, Esq., of Hartford, from whom he received the following letter:

"HARTFORD, CONN., *May* 26, 1859.

"WILLIAM H. BROWN, ESQ.—

"DEAR SIR: We have neglected to answer your very pleasant letter of the 5th of March, not from any hesitation in complying with your request, which we are happy to do, recognizing a right in the *grandfather* to have one of his own children's children, but, anticipating an opportunity of sending it as far as Altoona free of cost, like the present, we have allowed time to pass.

"Have you any memorandum of the precise time this train was run?—1832 is as near as we can locate the time. Please say if you have any memorandum of the persons who are represented in the cars. We personally remember you well, having had our figure cut out by you when in this city.

"With respect, and very truly yours,

"JAMES L. HOWARD & Co."

A few days after receiving the above letter, the picture arrived by Adams's Express, free of cost and charges. The author is at a loss how to describe his pleasurable feelings of pride and satisfaction when, after

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a lapse of twenty-eight years, he placed his eyes upon this specimen of his handiwork which he never expected to behold again, rescued as it was from almost absolute forgetfulness. Every curve and angle in the outline became as vivid as on the day when it was executed. The likenesses of the citizens represented in the cars were as fresh in his memory as if only seen the day before, and he was, as it were, transferred again to Albany and its associations.

CHAPTER XXXVII.

LETTERS FROM OFFICIALS.

Desirous of receiving some authentic statistics of this first locomotive, the author addressed a letter to Erastus Corning, Esq., who was president of the road at that time, and the following answer was received:

"New York Central Railroad, President's Office,
"Albany, *December* 9, 1859.

"Mr. William H. Brown—

"Dear Sir: Yours, respecting the introduction of the first locomotive on the Mohawk and Hudson Railroad, and asking information in relation thereto, was duly received.

"I referred your communication to John T. Clark, Esq., of Utica, who was at the time resident engineer and superintendent of transportation, requesting of him such information as he might be able to furnish. I send you herewith his reply, and by American and Adams's Express a photograph copy of the sketch in the Hartford Athenæum. I remember well your original cutting in black paper of the first locomotive, the 'De Witt Clinton,' and her train of cars. I was forcibly struck on viewing it by its accurate resemblance to the engine and train of cars attached. Yours very respectfully,

"Erastus Corning."

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The following is Mr. Clark's reply to Mr. Corning's letter. It was forwarded to the author:

UTICA, N. Y., *November* 21, 1859.

"HON. ERASTUS CORNING, Albany—

"MY DEAR SIR: I received, on the 18th inst., your note, with Mr. Brown's letter to you, seeking for information as to the time when the first experiment was made, with a locomotive-engine, on the Mohawk and Hudson Railroad, and other particulars in relation to the early history of the road.

"Before answering your letter, I wished to consult Mr. John B. Jervis, of Rome, to procure from him some facts in relation to details in the construction of the first locomotive. I went to Rome on Saturday for that purpose alone, but, not finding him at home, I send you to day such facts as I can gather from memory, and some papers in my possession.

"The first experiment with steam upon the road was made with the locomotive 'De Witt Clinton,' in the latter part of July, 1831. This engine was built at the West Point Foundery Works, New York. A Mr. Matthew had charge of the hands fitting up the machine, and came with it in charge to Albany. This engine was contracted for by John B. Jervis, Esq., the chief engineer of the road. The estimated weight of the 'De Witt Clinton' was about six tons. It was mounted on four wheels, of about five feet diameter each, and had single drivers. The hubs and rims of the wheels were of cast-iron, with wrought-iron spokes and tires. I feel certain that the 'De Witt Clinton' had an iron tank or tender on four wheels. The first locomotive-engine which came from England, and was afterward put on the road, was made by Stephenson, and was called the 'Robert Fulton.' This engine was double the size and weight of the 'De Witt Clinton.' It arrived about the latter part of August, 1831, and was put on the road about the 10th to the 20th of September following. On the occasion of an excursion which was to take place the latter part of September, great preparations were made for a large crowd of passengers, as the Governor, judges of the courts, and members of the Legislature, were expected to participate in the ride, and consequently the most powerful engine, the 'Robert Fulton,' pull the train. But it did not so happen: something (I do not remember now) got wrong with 'Robert Fulton,' and 'De Witt Clinton' took his place at the head of the train, which being too heavy for

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so small a machine, a part only was attached to the 'De Witt Clinton,' and the remainder were drawn each car by a horse, making a very amusing-looking cavalcade. I think 'Fulton' would have done better and have been more at home upon the Hudson River than on the stand upon the Mohawk and Hudson Railroad. However, on that occasion the little 'De Witt' acquitted herself well, and got to the end of the road long before her companions by horse-power arrived, and did the same in returning. Mr. Brown's sketch was taken on the first excursion with the 'De Witt Clinton,' before the time of this second excursion, and the arrival in this country of the first locomotive from England, the 'Fulton,' for our road. The second locomotive which came from England arrived nearly a year after—perhaps not so long, but I remember it was late in the fall of the year. This second engine came without a tank or a tender. A temporary arrangement was made for supplying this English engine with water by means of a cask with the capacity of about three hundred gallons, made in the usual form and manner of a cask, and resting on saddles of wood fastened to a frame of the same material; and the whole, being mounted on four light cast-iron wheels, presented a very novel appearance.

"This English locomotive was called the 'John Bull,' and had four driving-wheels of four feet diameter. The hubs and naves of the wheels were made of cast-iron, the spokes and rim or felloes were made of wood and secured by wrought-iron flanged tires. It is, perhaps, needless to say that after this engine was put in use, those parts of the wheels made of wood gave audible complaint of hard service. The 'shrieking' of the machine caused no little merriment among the knights of the whip, who were yet reluctant in believing that the beautiful tandem teams which they had the honor of driving formerly over the road, at the rate of twelve miles an hour, 'could ever be superseded by such a cursed-looking iron concern as that, as it was broken-winded already!'

"The first regular trip for the public with a locomotive was on the 9th day of August, 1831, with the 'De Witt Clinton.' A few experiments had been made with her previous to that date.

"Mr. John B. Jervis was chief engineer of the road, and the undersigned was resident engineer and superintendent of transportation; and he had the honor and satisfaction of receiving, with his own hands, the first fifty cents for regular established passenger-fare ever received on any railroad in the United States, as he believes. The names of the first three engine-drivers employed by

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the company were David Matthew, who first run the 'De Witt Clinton,' John Hampson, and Adam Robinson.

"It has been said by some that the first locomotive-engine actually run in this country in the transportation of passengers on a railroad, was upon the Charleston Railroad, in South Carolina, drawn by an engine called the 'Best Friend,' but this I believe is a mistake. The fact can easily be obtained by Mr. Brown addressing a letter to Horatio Allen, Esq., now of the Novelty Works, New York. Mr. Allen was the chief engineer of the Charleston road in its commencement, and would know of this incident.

"I recollect seeing Mr. Brown's sketch of the 'De Witt Clinton' and her train of cars executed in black paper, in his peculiar style, when he was in Albany; and I could not but admire the wonderful correctness of his likenesses to the engine, engineer, and the old citizens of Albany, who are represented in the cars as passengers.

"I am very respectfully and truly yours,

"JOHN T. CLARK, *Utica.*"

We will now add the following letter from John B. Jervis, Esq., the chief engineer of the road, showing that the sketch of the engine and train of cars which appears in our work is the "De Witt Clinton," an American locomotive, the first ever run in the State of New York, and not, as has been represented in Sage & Son's lithograph, the "John Bull," an English engine and the first attached to a passenger-train in the United States, or as published since that time, by the Antique Publishing Company, of Boston, in 1870, as the "John Bull."

"ROME, N. Y., *April* 20, 1869.

"WILLIAM H. BROWN, ESQ.—

"DEAR SIR: Yours of the 15th inst. was duly received. I have no memoranda to refer to; but my memory serves me that you are correct in saying that the first engine or locomotive run upon the Mohawk and Hudson Railroad was named the 'De Witt Clinton,' and the date of the first trip correct, viz., the 9th day of August, 1831. The engine was built under a contract I made (as chief engineer of the road) with the West Point Association in

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New-York City. Late in the same year, the English engine the 'John Bull,' was imported from England, for the same road. Mr. David Matthew was the machinist who put up the 'De Witt Clinton,' and run it, and no doubt his statements upon the subject are reliable. I do know, positively, that an American-built locomotive was put in successful use upon a railroad in this country prior to the 'De Witt Clinton;' my own impression is that there were two on the South Carolina Railroad.

"Respectfully, your obedient servant,

"JOHN B. JERVIS."

CHAPTER XXXVIII.

ADDITIONAL LETTERS.

HAVING heard a short time since from an old citizen of Albany, who knew the individuals whose likenesses appear as passengers in the sketch of the "De Witt Clinton" and train, that, excepting Judge Gillis, whose letter we have already given, only two now survive that memorable event, namely, Erastus Corning, Esq., and Thurlow Weed, Esq., the author addressed them upon the subject, calling their recollections to his professional visit to Albany in 1831, and his original profile cutting of the first locomotive and train. He soon received the following interesting replies, which serve to prove the authenticity of his original in the Connecticut Historical Society:

"ALBANY, N. Y., *May* 30, 1870.

"WILLIAM H. BROWN, ESQ.—

"MY DEAR SIR: I have before me your letter of May 19th, 1870, referring to your proposed 'History of the Early Locomotives of America.'

"It gives me great pleasure to testify to the correctness of the

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photograph copy of your original cutting of the locomotive 'De Witt Clinton,' and the train of cars which passed over the Mohawk and Hudson Railroad, I think in August, 1831.

"I submitted a letter on the subject, written by you, in the year 1859, to Mr. John T. Clark, and sent you his reply, with a photograph copy of your picture.

"The likenesses of the passengers in the train are excellent, and probably the only collection of the kind in existence. Your forthcoming book will be a very interesting one and a valuable addition to railroad literature. I look for the appearance of it with the anticipation that it will be profitable and instructive.

"Yours very truly,

"ERASTUS CORNING."

The second letter was from Thurlow Weed, Esq., and was written by the veteran's daughter, Miss Harriet A. Weed, who acted as his amanuensis:

"NEW YORK, *February* 5, 1870.

"MR. WILLIAM H. BROWN—

"DEAR SIR: My father, who is not himself able to write, desires me to express his thanks for your interesting and welcome letter. He remembers you as temporarily residing at Albany. He also remembers your peculiar skill in fashioning paper pictures. Early in the day of photographs, a copy of your picture was sent to us from Hartford. My father has often been applied to for the names of the passengers, but could not remember them all. He does, however, remember Lewis Benedict, John Townsend, William Alexander, John J. Boyd, John Meigs (high constable of Albany), John J. De Graffs, and Hugh Robinson, of Schenectady. He thinks also that Billy Winne was one, and he remembers your being there looking at the engine.

"The best likeness we have of my deceased brother James is from your sketch of him as a member of the Burgess's Corps of Albany.

"The photograph copy of your Albany and Schenectady Railroad engine, copied from the original in the Connecticut Historical Society, now hangs in our library, looking precisely as my father remembers it while being fired-up for its first trip to Schenectady, thirty-eight or thirty-nine (nobody here can tell whether it was in 1831 or 1832) years ago.

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"My father says that he shall look for your book with much interest. He, too, as fast as his impaired health permits, is putting his recollections together, with the material for history in his possession, on paper, with a view to publication.

"Truly yours,

"HARRIET A. WEED."

Before we close this portion of our evidence, we cannot refrain from giving to our readers a second letter from John B. Jervis, Esq., who was chief engineer of the road, in reply to the author, who had transmitted to him some documents for his examination. This letter reads as follows:

"ROME, N. Y., *August* 24, 1870.

"WILLIAM H. BROWN, ESQ.—

"MY DEAR SIR: Yours of the 22d inst. came to hand this A. M. I have been quite interested in reading the letters and papers you sent me. The photograph picture of the first locomotive and passenger-train that certainly was the first run on the Mohawk and Hudson Railroad (Schenectady and Albany, now a portion of the New York Central Railroad) is a good representation.

"The engine was the 'De Witt Clinton' (and not the 'John Bull,' as the newspaper scrap from the *Boston Advertiser* gives it). There can be no doubt on this point—engine, tender, and cars, are an unequivocal delineation.

"I have had a copy of this picture for several years.

"I cannot speak as to exact date when the train was run, but it was about midsummer of 1831.

"I have no doubt Mr. Clark is correct as to the date trials were made, the latter part of July. The excursion-train was most probably made, as Mr. Clark states, on August 9, 1831. Mr. Clark's account of the building of the engine, at the shops of the West Point Foundery, in New York, is correct. I think, indeed I am certain, the English engine 'John Bull' did not arrive until the spring of 1832.

"I was quite interested in your biographical remarks, and hope the great labor you have given to prepare a correct history of the locomotive may prove amply remunerative. I shall be glad to

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see your book. It is a very important subject. Great progress has been made, and there is yet much to be done. I sometimes feel a desire to resume attention to this matter, but my age (seventy-five years) admonishes me that it is better to be quiet.

"Very truly your friend,

"JOHN B. JERVIS."

We will now add to our history of the early locomotives built in America by giving Mr. William Kimball's letter to the author upon the subject. Mr. Kimball was superintendent and manager of the West Point Foundery Works, in the city of New York, during 1829 to 1831, and for many years after.

"WEST POINT FOUNDERY OFFICE,

"NEW YORK, *June* 12, 1871.

"MR. WILLIAM H. BROWN—

"DEAR SIR: Your letter informs me that you are about to publish a history of the early locomotives built in America, and ask me for some particulars respecting the first locomotives built at our shops.

"It gives me great pleasure, sir, to comply with your wishes on that subject; and I will commence by saying that the first locomotive ever run in this country was imported from England, and was called the 'Stourbridge Lion.' It came out in the spring of 1829; was in charge of Horatio Allen, Esq.; was landed from the ship John Jay at our wharf and put up at our works. This locomotive was for the Delaware and Hudson Canal and Railroad Company.

"The first locomotive ever constructed in this country and for actual service upon a railroad, was undoubtedly built at our works. It was contracted for by Colonel E. L. Miller, of Charleston, South Carolina, for the South Carolina Railroad. It was commenced early in the summer of 1830, and completed and sent to Charleston by the ship Niagara in the month of October of that year. This engine was called the 'Best Friend.'

"The second locomotive constructed in America was also built at our works, and for the South Carolina Railroad. This engine was contracted for by Horatio Allen, Esq., the chief engineer of the road, and was built from drawings sent out by him.

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"This locomotive was called the 'West Point.' It was finished and sent to Charleston by the ship Lafayette, in February, 1831.

"A third locomotive was soon after constructed at our shops. This machine was contracted for by John B. Jervis, Esq., chief engineer of the Mohawk and Hudson Railroad, and was finished and forwarded to Albany in June or early in July, 1831. This engine was called the 'De Witt Clinton.' Mr. David Matthew, who had charge of the hands fitting up all these engines, went on to Albany with the 'Clinton' to put it on the road and to run it.

"There can be no doubt whatever but that these locomotives, the 'Best Friend,' the 'West Point,' and the 'De Witt Clinton,' were the first ever built in America for actual service on a railroad. Prior to and during that time, from 1829 to 1831, several small machines for experimental purposes were built and tried, but the three above named were the first ordered to be built in America for actual service upon a railroad.

"Hoping these facts may be of service to you in your forthcoming work, I remain, dear sir,

"Yours respectfully

"WILLIAM KIMBALL."

CHAPTER XXXIX.

THE AUTHOR'S ART.

THE following are a few of over a thousand newspaper comments and letters upon the author's skill in the various departments of his art. They are given here merely as proofs that our readers may rely upon the accuracy of the representation of the "De Witt Clinton" engine, cars, and passengers which accompanies our work, and appears in simple black outline.

(*From the Albany Argus, August*, 1831.)

"Decidedly the best thing we have seen for many a day we met with yesterday in dropping into the rooms of Mr. William H.

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Brown, the artist, on State Street. He has taken some of the best likenesses of a number of our citizens in his peculiar style, namely, cut out of black paper with a pair of common scissors. The one of our old and esteemed neighbor, Job Gould, is decidedly the most striking picture we have ever looked upon. The facility and correctness with which Mr. Brown takes these likenesses are really astonishing.

"We recognized also, at a single glance, others as natural as life itself. For instance, the venerable penny postman, Billy Winne, Jerry Jewell, Mr. Alexander, little Chapman, the dwarf, Mr. Carter, of the Clinton, John J. Quackenboss, ex-Governor Meigs, Thurlow Weed, General Root, Mr. Phelps, Mr. Van Zant, and a host of others, and, what is the most astonishing feature about them, they were all taken from memory. These individuals were pointed out to Mr. Brown upon the street as well-known characters in our city, and, after several hours, were transferred by his magic scissors upon paper, if not quite as large as life, at least twice as natural."

(*From the Albany Evening Journal.*)

"Our friend Mr. William H. Brown, the inimitable artist, has fairly taken the patronage of our citizens by storm. From morn to night his rooms are besieged by anxious applicants, awaiting their chance for the operation of his magic scissors. For every one accommodated, three stand ready as successors. We are gratified at the result of Mr. Brown's visit among us, not more for the encouragement extended to superlative skill than the satisfaction of witnessing individual worth so highly appreciated. He has recently taken in one large picture the entire Burgess's Corps, with staff and band in full parade, in which the likeness of each individual member is presented with an accuracy truly surprising, and stamps Mr. Brown as a perfect master of his profession. Those who have not seen his portraitures should embrace the earliest opportunity, as he remains, we regret to say, but one week longer, his departure for that time being deferred for the purpose of taking the likenesses of Engine Company No. 2. The courteous and cheerful deportment of Mr. Brown toward his visitors renders a visit to his rooms most agreeable and instructive."

(*From the St. Louis Bulletin.*)

"Great Doings at Brown's.—This wonderful artist—yes, we will out with it—the immortal Brown—has just completed the

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most splendid thing in his line that was ever seen in this city. It is nothing less than a profile likeness of the St. Louis engine, the two hose-carriages, and sixty-five members of that valiant and invincible corps. The members are all in the uniform of the company, forty attached to the drag-ropes of the engine, thirteen to the ropes of one hose-carriage and twelve to the other. We will take the liberty of styling it a panoramic view of the St. Louis Fire Company, and we are compelled to say that in this kind of panorama all other artists must bow in humble submission before the scissors and the skill of the unequalled Brown. This method of styling it will not be deemed inappropriate when we tell you that the whole picture occupies a space of twenty-five feet in length. The representation of the engine is beautiful indeed, and true to the very letter, and is all the work of a pair of small scissors and black paper. On the opposite side of the artist's room may be seen another specimen of his skill in a second picture of the same kind, representing the Missouri Fire Company, with her engine, hose-carriage, and tender, with fifty-nine men in all. The company are represented in their winter costume as returning from a fire or drill, the whole picture presenting a fine and novel appearance, and are perfect and characteristic likenesses. The two pictures are intended as decorations for their several engine-houses."

"ARMORY NATCHEZ FENCIBLES.

"At a called meeting of the Natchez Fencibles, held at their armory on Thursday evening, June 13, 1844, the following resolutions were unanimously adopted:

"1. *Resolved*, That the thanks of this company be tendered to Mr. William H. Brown for the admirable picture of this corps, just completed by him, which, in all its details, fully sustains the high artistical reputation of Mr. Brown, and has won the undivided admiration of the members of the Natchez Fencibles.

"2. *Resolved*, That the foregoing resolution be published in the *Daily Courier*.

"LEVI S. HARRISON,
"*Secretary Natchez Fencibles.*"

"WASHINGTON, *September* 20, 1843.

"WILLIAM H. BROWN, ESQ.—

"MY DEAR SIR: Yours, postmarked Philadelphia, 1st September, addressed to me at Accomac Court-House, Virginia, I

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found on my arrival here last evening. I am under very many obligations to you for not publishing or printing the letter referred to by you without giving me the opportunity which you have so kindly done to correct its many imperfections. I do not desire it to be published while it contains a single hard word or thought of any human being. I never have deliberately and wantonly wounded a fellow-being, though I have often done so, sometimes from a sense of duty and sometimes impetuously. Even if I were inclined to *lash* any one for 'lashing's' sake, I do not think your intended volume would be the proper place for it. I do not prize my fame for the faculty of saying severe things very highly; and he who is gifted with the power and constrained by the necessity of saying harsh things, or even of speaking out his mind and feelings strongly, however honestly, in this world, is not apt to be blessed with the mild judgments of men himself. I trust now that, having passed the profile stage of life, and got into the author's line, you can look at the world full-face. I have often seen and admired your productions and the wonderful faculty of fixing the resemblance of men on paper with the aid of your scissors and black paper only. I have never failed to recognize a striking likeness to the original in all I have seen even of the most casual acquaintance.

"With thanks for your kindness, and the flattering notice you propose to take of my humble self, I am,

"Gratefully yours,

"HENRY A. WISE."

"LINDENWALD, *September* 6, 1843.

"WILLIAM H. BROWN, ESQ.—

"DEAR SIR: It affords me much satisfaction to embrace the opportunity you have presented me, to express the very favorable opinion I entertain of your skill in your peculiar style of profile cutting; and with my best wishes for your success in your forthcoming work.* Very truly yours,

"M. VAN BUREN."

"WASHINGTON, *January* 12, 1845.

"WILLIAM H. BROWN, ESQ.—

"DEAR SIR: I take pleasure in bearing testimony to your great aptitude in taking likenesses in your way, and the fidelity with which they are executed. I wish you great success in the

* "National Portrait Gallery."

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work you are about to publish, and do not doubt but that you will make it worthy of public patronage. With great respect,

"I am, etc.,

"J. C. CALHOUN."

"WASHINGTON CITY, *January* 13, 1843.

"WILLIAM H. BROWN, ESQ.—

"MY DEAR SIR: Your favor of the 3d instant is before me, and in reply I will say that the likenesses of the members of Congress and other public men of the times, taken by you in your peculiar and characteristic style, are remarkably correct, and easily recognized at a glance.

"My friends unite in saying that the one you took of myself is a striking likeness. I cannot, however, see its resemblance to the original as I do in all the others. It is an old and very true saying, 'that if we could see ourselves as others see us,' etc.

"I wish you great success in your contemplated work. It cannot otherwise than prove acceptable to the public, who feel an interest in the records of men who have devoted their best faculties to their country's service, which your 'Portrait Gallery' will exhibit. With great respect,

"Yours truly,

"DANIEL WEBSTER."

"LEXINGTON, KY., *October* 13, 1843.

"WILLIAM H. BROWN, ESQ.—

"DEAR SIR: Your favor of the 2d instant is received. I well remember your collection of the likenesses of our public men, members of Congress, the Cabinet, and other officials in and about Washington City, and I will say that I was particularly struck with their truthfulness. That of the Hon. John Randolph, of Roanoke, is the very perfection of your art. I shall not soon forget the amusement you afforded the visitors at the Blue Lick Springs last summer, by your delineations of many of them in your peculiar and characteristic style of portraiture, unequalled by any other artist in that way I have ever seen.

"The work you propose to publish will, no doubt, be an interesting acquisition to the reading public, and I request you here to put my name down in the list of your subscribers for a copy as soon as it is ready for distribution. With great respect, I remain,

"Yours truly,

"HENRY CLAY."

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The foregoing letters are in allusion to a "Portrait-Gallery of Distinguished Public Men," published by the author a few years after. They are referred to in this work merely as further evidences of the author's skill in his peculiar art of sketching in black paper outline or profile, that our readers may rely upon the correctness of the representation of the "De Witt Clinton" and train, which we insert.

CHAPTER XL.

RECAPITULATION.

We trust that we have now faithfully performed the task undertaken by us, when we commenced these pages; and we believe that our readers will not entertain a doubt, from the chain of authentic and reliable evidence we have brought before them, that the first locomotive ever run upon a railroad in this country was the "Stourbridge Lion," imported from England in 1829. We have shown that this machine was ordered by John B. Jervis, Esq., the chief engineer of the Delaware and Hudson Canal and Railroad Company, to be used upon their road, which connected with their canal; that Horatio Allen, Esq., the assistant engineer under Mr. Jervis, was on a visit to England, and witnessed the experiments then made in the contest for the prize of £500 offered by the Liverpool and Manchester Railroad for the locomotive that should perform certain requisitions; that Mr. Allen was instructed by Mr. Jervis to contract for three locomotives for the Delaware

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and Hudson Railroad; that the first of these engines, the "Stourbridge Lion," arrived in the city of New York by the ship John Jay on the 17th of May, 1829, and was set up by Mr. Allen in the yard of the West Point Foundery Works, then in the city, and, with steam from the shops, publicly exhibited for several weeks, and visited by thousands attracted by the novelty of the machine.

We have shown that the "Stourbridge Lion" was next shipped up the Hudson River to Rondout, where it arrived on the 4th of July, 1829, and thence forwarded by the Delaware and Hudson Canal to Honesdale, where it was landed on the 23d of July, was immediately placed upon the company's railroad, and made its first trial-trip under steam on Saturday, the 8th day of August, 1829, in the presence of several thousand spectators attracted from all parts of the country to witness the advent of the first locomotive in America. We have also shown that on that memorable occasion Mr. Allen stood alone upon the engine, and with his own hand opened the valve that gave the impulse to the driving-wheel that made the first revolution upon a railroad in America.

From the most reliable sources our readers have been informed that the first locomotive ever built in America was a "Liliputian" affair, made for experimental purposes alone. It was nevertheless a locomotive, and was built by Peter Cooper, Esq., of New York, well and most favorably known as the founder and patron of the Cooper Institute of that city. This little machine of Mr. Cooper's (we call it little because it weighed less than a ton) was expressly built to demonstrate a principle upon the Baltimore and Ohio Railroad with regard to the capability of a locomotive

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to sustain itself upon the track in running curves—a much and almost universally disputed point among engineers and scientific men of that early period in railroad experience.

From the evidences we have given, our readers must now be convinced that the very first locomotive built in America for actual service was ordered by and made for the South Carolina Railroad then just commenced, and but a few miles completed. This first locomotive was contracted for by E. L. Miller, Esq., an enterprising gentleman of Charleston, who had visited England and witnessed the contest for the £500 prize. Mr. Miller had his locomotive constructed at the West Point Foundery Works in the city of New York. Mr. David Matthew, then a foreman in the machine-shops, had charge of the hands fitting up this machine or locomotive. It was called by Mr. Miller the "Best Friend, of Charleston," and was forwarded by ship Niagara, and arrived in Charleston on the 23d of October, 1830. No person accompanied this locomotive from the works in New York to put it up and try its abilities upon a road. That duty was performed by Mr. Julius D. Petsch, foreman of Mr. Thomas Dotterer's machine-shops in Charleston, assisted by Nicholas W. Darrell, a young man just out of his time. The first experiments with a train, we have shown, took place on the 2d of November, and again on the 14th and 15th of December, 1830, on which last trial-trip before the public, as from the first, the machine was in charge of Mr. Darrell as engineer, who continued to act in that capacity until the June following, when, through the ignorance of the negro fireman, the "Best Friend" exploded, severely scalding Mr. Darrell, and resulting finally in the death of the negro from his injuries.

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We have given evidence to show that the second locomotive built in America was likewise constructed at the West Point Foundery Works, and for the South Carolina Railroad. This machine was ordered by Horatio Allen, Esq., the chief engineer of the road, and made from plans and drawings sent out by him. The engine was completed and forwarded by the ship Lafayette, and arrived in Charleston on the 28th day of February, 1831, and made her first successful trial-trip over the road on the 5th of March, 1831. This locomotive was called the "West Point," and was in charge of Mr. Darrell, who meantime had recovered from the injuries received by the explosion of the "Best Friend." Mr. David Matthew also had charge of the hands fitting up the "West Point" as well as the "Best Friend" at the Foundery Works, New York.

We have produced satisfactory evidence to prove that the third successful locomotive constructed in America was the "De Witt Clinton," built also at the West Point Works for the Mohawk and Hudson Railroad. This engine was completed and taken to Albany the latter part of June, 1831, in charge of Mr. David Matthew, who put it upon the road, and, after several experimental trials in July, made the first excursion-trip with a train of cars on the 9th day of August, 1831, as represented in the author's sketch taken upon the spot just as the train was about to start.

We have shown that about this time (midsummer, 1831) the locomotive built by Mr. Davis at York, Pennsylvania, was put upon the Baltimore and Ohio Railroad, as the most effective of the number presented at the trial for the prize offered by that company. Of the doings of this engine, we have a further and more particular account in an extract we make from a work

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entitled a "History and Description of the Baltimore and Ohio Railroad," presented to us by B. H. Latrobe, Esq., of that road, thus:

"In pursuance of this call upon American genius, made by the directors, three locomotives were produced upon the road, only one of which, however, was made to answer any good purpose. This engine, called 'The York,' was built at York, Pennsylvania, by Phineas Davis (or rather Davis and Gartner), and, after undergoing certain modifications, was found capable of conveying fifteen tons at fifteen miles per hour on a level portion of the road. It was employed on that part of the road between Baltimore and Ellicott's Mills, and generally performed the trip to the Mills in one hour, with four cars, being a gross weight of about fourteen tons. This engine was mounted on wheels, like those of the common cars, of thirty inches diameter, and the velocity was obtained by means of gearing with a spur-wheel and pinion on one of the axles of the road-wheels.

"The curvatures were all travelled with great facility by this engine, its greatest velocity, for a short time, on straight parts of the road, having been at the rate of thirty miles per hour, while it frequently attained that of twenty miles, and often travelled in curvatures of four hundred feet radius, at the rate of fifteen miles per hour. The fuel used was anthracite coal, and answered well; but the engine, weighing but three and a half tons, was found too light for advantageous use in ascending grades. The performance of this engine fully confirmed the board and its engineer corps that locomotives might be successfully used on a railway having curves of four hundred feet radius, and from that time forward every encouragement was given by the company to the inventive genius of the country to improve on the partially successful experimental engine that had been produced by Mr. Davis.

"In September, 1835, Mr. Davis met with a sudden and unexpected death. He was riding upon the tender of a new locomotive, on its trial-trip upon the Washington branch, accompanied by a large number of his employés on an excursion to the capital. The engine struck the end of a broken rail and was thrown off the track. Mr. Davis was hurled with great force against the engine, causing his instantaneous death. This melancholy event produced a deep gloom over the excursionists and the whole community where Mr. Davis was known. In his death the Baltimore and

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Ohio Railroad met with a great loss. He was an able and ingenious mechanic, and one of the most indefatigable assistants to the company, in its experimental and mechanical department."

But to resume our history. We have shown that, as early as 1831, the first eight-wheeled locomotive ever built, either in England or America, was constructed from plans by Horatio Allen, Esq., and put upon the South Carolina Railroad. This machine was made at the West Point Foundery Works, and forwarded to Charleston in charge of Mr. John Degnon, who run it for a short time until accepted by the road, and then it was placed in charge of Mr. Darrell.

We have, in the course of our narrative, shown that the South Carolina Railroad was the first railroad in the world built expressly for locomotive-power; that when Mr. Bennett's famous resolution to that effect was unanimously adopted by its board of directors, the directors of the road from Liverpool to Manchester in England, just completed, had not yet determined what kind of power should be used upon the road. A majority of the committee of engineers, appointed to examine and report upon that important matter, were in favor of stationary engines with long chains or ropes to draw the trains over the road. George Stephenson, being one of their number, was alone in favor of the locomotive. Again we show that the first one hundred consecutive miles of iron rails upon a road was laid upon the South Carolina Railroad. These statements, though startling to the minds of many, are nevertheless true, and can be sustained by the best authority, and without a shadow of doubt.

Mr. William Kimball, who was in charge of the West Point Works during the year 1829, and afterward while these machines were built, in his letter to

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the author fully sustains all the facts connected with the early history of the English engine "Stourbridge Lion," and the first three American engines built in the United States, viz., the "Best Friend," the "West Point," and the "De Witt Clinton;" and no further evidence is required to establish these facts.

CHAPTER XLI.

FIRST TRUCK-ENGINE.

These experiments on the South Carolina Railroad paved the way for several others which soon after followed, and at this day they are looked upon as more remarkable, from the early date in locomotive enterprise in which they were attempted, and with such surprising results. One of the most important of these early efforts was the introduction of the truck under the front part of the machine, to assist in sustaining the weight of the boiler, and to give direction to the machine in running upon curves.

As this truck attachment has now become so universally adopted, and has never been patented, we will give a description of the first machine ever built which used it. We take it from a letter received by the author from Mr. David Matthew, who superintended the hands while constructing the machine. Mr. Matthew thus writes:

"American locomotive No. 1, second series, was built at the West Point Foundery Works, for the Mohawk and Hudson Railroad, from plans sent by John B. Jervis, Esq., chief engineer of that road. I left New York in August, 1832, with the engine in charge

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to place on the road and run it. This was the first bogie engine or truck used under the front part, ever built in this country or any other. The engine had nine and a half inch cylinders, sixteen-inch stroke, and had two pairs of driving-wheels five feet in diameter, and set aft the furnace; had four wheels, thirty-three inches' diameter, in the truck. This truck was placed under the front end of the boiler for support, attached by a strong pin, and worked upon friction-rollers so as easily to follow the curves of the road, as the fore-wheels of a carriage upon common roads.

"The boiler-furnace was five feet long, by thirty-four inches wide, with three-inch tubes, and made to burn anthracite coal. With this engine I have crossed the Mohawk and Hudson Railroad from plane to plane, fourteen miles, in thirteen minutes, making one stop for water. I have tried her speed upon a level, straight line, and have made one mile in forty-five seconds by the watch. She was the fastest and steadiest engine I have ever run or seen, and she worked with the greatest ease.

"The first of this kind of engine, with the truck in front, ever built in England, was the 'Davy Crocket,' constructed by Robert Stephenson, for the Saratoga Railroad Company, from drawings and plans sent out to him by John B. Jervis, Esq., who was the inventor of this attachment. I never tried this engine at her speed, but all her movements were with similar ease, and it did not work us all over to take eighteen to twenty cars over the road. This machine was placed on the road in 1833, and run for many years. She had two driving-wheels aft and four truck-wheels. The driving-wheels were aft the furnace, which plan was adopted by M. W. Baldwin, who claims this as the general arrangement. But the original plans and drawings, from the inventor, John B. Jervis, Esq., are yet in my possession."

Of this engine Mr. Jervis thus speaks in a letter addressed to the author, April 20, 1869:

"Not satisfied with the working of four-wheel engines, in the fall of 1831 I made a plan with a set of trucks as leading-wheels, which was executed by the West Point Foundery Association, New-York City.

"This engine gave rise to the plan of truck-leading, or rather this engine was made on the plan which is now in geueral use on American railways.

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"Mr. David Matthew was the machinist who put up this truck-machine. I regard it as the greatest point that an American engineer, in the face of English practice, should have devised a plan, which at the time was considered very radical, of introducing a truck to support the end of the frame and guide the motion of the engine, and which, after thirty-seven years of experience, is now adopted on every engine of nearly fifty thousand miles of railroad in America."

During the past forty years, while railroads were stretching forth their iron arms over vast sections of our country, and indeed of the civilized world, and even through the wild and thinly-populated domains of the savage, where exist vast forests and hitherto pathless deserts of sand, locomotives, those absolute essentials to the economy and success of these enterprises, were in like manner making giant strides in the way of improvement, from the "Rocket" of Stephenson in England, and the "Best Friend, of Charleston," in this country, to the perfection which characterizes the first-class locomotive of the present day. When we compare the performances of these and their readiness at all hours, and under all circumstances, to brave the torrents, the winds, and the snows of the most terrific tempest, we cannot but call to mind an advertisement in a Philadelphia paper in 1832. This we will extract just as it appeared. It will, no doubt, draw a smile upon the faces of our present locomotive engineers. It reads thus:

"Notice to the Public.—The engine, with a train of cars, will be run daily, commencing this day, when the weather is fair; when the weather is not fair, the horses will draw the cars. Passengers are requested to be punctual at the hour of starting."

When we contemplate the rapid march made, upon this continent alone, in railroad and locomotive im-

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provement, it seems like the work of enchantment. The mind is bewildered and almost carried away in its efforts to keep pace with or follow its giant strides.

Let us (by way of illustration) conduct our reader for a few moments to some imaginary eminence, from which his eye could command in one sweep the entire surface of our country. Let him turn his gaze toward the north, the south, the east, or the west, even across the Rocky Mountains to the shores of the broad Pacific, and he will behold a scene of life and industry which few could be prepared to believe had been developed in less than half a century. And then let him predict the future—if he can. Lead his mind back to the period just forty years ago, when, on the 17th day of December, 1830, the first locomotive built in America for actual service upon a railroad, and known as the "Best Friend, of Charleston," started out upon its solitary journey, a few miles only in extent, upon the unfinished track of the South Carolina Railroad—the second railroad commenced in this country for commercial purposes, and the first railroad in the world built expressly for locomotive-power. Let him contemplate this scene for a moment, then turn his mind to the one presented to him at the present day; all over the wide expanse of our Union, behold the countless railroads extending for thousands of miles in every direction, bearing upon their rails their droves of iron horses, of every imaginary form and pattern, dashing with lightning-speed from city to city, with their long and heavy trains of living, breathing human creatures, or with their lengthened trains of freight-cars, loaded with thousands of tons of the products of the industry of the people, adding millions to the trade and commerce of the nation, rushing on, overcoming all obstacles, crossing wide, deep, and

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rapid rivers, ascending the steepest grades, or driving headlong through lengthened tunnels—then ask the beholder if we have yet reached the summit, the consummation, the ultimatum of this great instrumentality in the advancement of the trade and commerce of our prosperous republic. He will answer, "No! No one can tell—no one can predict—no mind can conceive—no figures can compute the sum of what will be the progress in the next forty years of this great achievement of the present century, in the railroad and its iron steed."

Forty years ago an imported locomotive (weighing scarcely a half-dozen tons) made the first experimental trip, of a few miles only, upon a coal-road belonging to the Delaware and Hudson Canal Company. This machine proved to be too heavy for the structure, and its innumerable trestles and bridges, and it was abandoned, and the road soon after remodelled into a graded one with stationary engines, as was recommended about the same time (1829) by the most prominent English engineers to the directors of the Liverpool and Manchester Railroad, in preference to the locomotive system, which they looked upon as impracticable.

Not the least daunted or discouraged by the failure of this first experiment at home, and the opinions and examples before them in England, the directors of the South Carolina Railroad, at their first regular meeting, only five days after their organization, passed unanimously that memorable resolution in these very words: "that their railroad should be built for locomotive-power alone; that in selecting that power in its application to railroads, the maturity of which will be reached within the time of constructing their road, and render the application of animal power a great abuse of the gifts of genius and science." Their example was fol-

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lowed in quick succession on several railroads soon after in the progress of construction, and continued to spread with unprecedented rapidity to the present day.

We cannot quit the subject without again drawing before our readers a comparison between the locomotive passenger-trains of the present day and those of forty years ago, when the old-fashioned stage-coach-body pattern was the model for the first-class passenger-cars, as represented in the author's sketch, in this volume, of the "De Witt Clinton" and train. When we compare these vehicles with the splendid drawing-room, sleeping, and dining-room cars now coming into use upon some of the principal railroad thoroughfares and soon to become universal; and when the old and familiar voice of the conductor, announcing "Twenty minutes for dinner," will no longer be heard, but, instead thereof, the hungry traveller will be ushered into a splendid dining-saloon (attached to the train) and vying in elegance with the most sumptuous apartment, furnished and provided with all the concomitants of a well-appointed hotel, a table groaning under the weight of well cooked and prepared provisions, followed by all the luxuries of the various seasons through which they travel, served by polite and attentive waiters; and, at length, at the end of a well-enjoyed meal, the traveller will find himself some twenty-five or thirty miles farther advanced upon his journey than when he took his seat at the summons to dinner—all, all seems like the work of enchantment! In no other language, perhaps, can we better illustrate the wonderful strides made in the march of improvement, and the facilities of intercommunication within less than a quarter of a century, than by quoting here the words of John H. B. Latrobe, Esq., the eminent counsellor of the Baltimore

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and Ohio Railroad, at a banquet given in Wheeling in 1853, on the successful completion of that great enterprise:

"With your permission, Mr. President, I will read, as my text for what I propose to say, the following extract from the *Virginia Gazette*, published in 1836: 'The Baltimore and Ohio Wagon Company, with a capital of two hundred thousand dollars (one-fourth of which is paid in), transport goods and produce between Wheeling and Baltimore. One wagon departs and arrives daily from each of these places, with a load weighing from two and a quarter to two and a half tons, and occupying eight days upon the road, and arrangements are in progress to increase the number of daily arrivals and departures, from one to three wagons, and eventually to five.'

"Were a new edition to be prepared for the *Virginia Gazette*, and the paragraph relating to the intercourse of the two cities, Wheeling and Baltimore, to be placed side by side, how modest would appear to have been the conception of its author, only sixteen years ago!

"The arrangements to which we refer, carried out by a different company it is true, but still the arrangements, uniting Wheeling and Baltimore, have resulted in the existence of a company with a capital of twelve million dollars, all of which has been paid in; having in charge a work which, when completed and stocked, as it is intended that it shall be, will represent a capital of about twenty million dollars, and whose preparations, so soon as the delays attending the first use of all good public works shall have been surmounted, will insure the daily transportation, between the Ohio and Baltimore, of a thousand tons of goods and produce in the space of thirty-six hours now, and who can tell how much faster ere a few years have been added to the less than the quarter of a century just referred to.

"Why, Mr. President, the weight of the tonnage-engine alone used by this railroad company almost equals the weight of the five loads that limited the hopes of the wagon company, teams, wagons, and all; and behind this engine there rolls at the uniform speed of twelve miles an hour three hundred tons of gross weight, one-half of which is the exchange which the Western valleys send to the cities of the Atlantic border. We talk of the course of empire. Its type is the locomotive and its train, whose

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tread is the tread of a giant, from hill-top to hill-top. We speak of the array of a conqueror: where is there a conqueror like steam? Its panoply, too, is of iron; man has made it not less than mortal, as it performs the work of one hundred thousand of men's hands, and, as it is impatient of delay, it rushes through and through the bosom of the hills, its white and feathery plume is the ensign of a daring, a courage that treads its way through the forest, or climbs the side of the mountain, and a power which, while it may find its comparison in the crest of Henry IV. at Ivry, is the precursor of the triumphs, not of war, but of peace, as they build up the fame, not of heroes, but of the people. . . . That the fruition of these hopes will disappoint no reasonable expectations, but surpass them all, who of us can doubt? The West built up Baltimore—first with the pack-saddle, then with the county road, then with the turnpike—as it is now about to employ the greatest agent of modern times to realize for us the destiny appointed by Providence, when the waters of the fountains of the Potomac are made to flow from the same hills that sent their tribute to the Ohio."

In what language would Mr. Latrobe (who still lives to see it) express the wonderful results of the sixteen years which have succeeded the events we have just recorded? What comparison now would he draw of the daily transit over the Baltimore and Ohio Railroad with that daily wagon-load of from two and one-fourth to two and a half tons, and the ultimate prospect of it reaching five wagon-loads per day?

Again, on this memorable occasion, the completion of the Baltimore and Ohio Railroad, and the arrival of the first locomotive and train from Baltimore at Wheeling, a guest from Cleveland, James A. Briggs, Esq., made these appropriate remarks in allusion to the march of internal improvements in railways and locomotives:

"This is an occasion of no common interest. The men of Maryland, and Virginia, and Ohio, and Pennsylvania, have met here to commemorate the completion of one of the great lines of

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trade and travel between the Atlantic Ocean and the Ohio River. This line of railroad is a great work. It was originated by men who had the capacity to conceive great designs and the courage to execute them. The work is finished. The iron horse has travelled on his iron pathway from the 'Monumental City' over the Alleghanies to this not long since frontier settlement, but now the flourishing city of Wheeling. Here, in this room, are men who have heard the warwhoop of the Indian on this very spot, and to-day they have heard the shrill whistle of the locomotive. How wonderful that such changes have come within the memory of those who still live! And this is a change which tells not of war and carnage—not of cities desolated, and villages ruined, and fields laid waste—but of the progress of the arts of peace, of the advancement of a high order of civilization, and of the onward course of the car of Christianity, freighted with innumerable blessings for the whole world-wide family of man. . . . I do most cordially congratulate the people of Maryland and Virginia upon the completion of the Baltimore and Ohio Railroad. It is one link in the chain which binds us together as a nation. While I am now speaking, the locomotive that drinks and smokes, and is a 'fast fellow,' is thundering along on his iron track from the 'Queen City' of Ohio, and from the far-off prairies of Illinois, heading long trains freighted with men and the products of the rich fields of the West to Eastern markets.

"As I stood last evening on the bank of the Ohio, looking at the beautiful and magnificent iron bridge which spans the river like a bow, and gemmed and sparkling as it was with a thousand lights, I could but believe that the tall pipes of the majestic steamers would, in all coming time, bow as they passed to this grand work of the genius of man. Last March, a goodly number of the people of Cleveland and the Reserve were here to celebrate the completion of the railroad from the Lake to Wellsville. We are here to-night to rejoice over the advent of the iron horse from Baltimore to Wheeling, and, before this year shall have passed away, to be numbered with the years that have gone, we hope the last link in the line of railroad between Baltimore and Cleveland will be finished; and then, in return for your energies and enterprise and hospitality, we trust you may be invited to partake of true and genuine Yankee hospitality in the 'Forest City,' 'the City upon the Lake-shore,' and although the season may make it winter without, we can assure you that the warmth of the heart shall make it summer within."

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All this has been verified, and how much more will be accomplished within the next forty years to come no man can predict; for even now the author has noticed advertisements announcing through-tickets for sale for the round-trip from New York to San Francisco, passing through all the intermediate cities on the plains and returning, with beautiful and comfortable parlor, dining-room, dressing-room, and sleeping cars throughout the entire route. Price ninety dollars for the round-trip. N. B.—Excursionists have the privilege of going by any train or at any time, without restriction.

Another announcement on a much more extensive scale may now be seen posted up at all the hotels and railroad offices in the city of New York, and no doubt by this time in all other cities, which reads as follows:

"GREAT EXCURSION TO EUROPE AND THE EAST.

"Visiting London, the seat of the last war in France, Switzerland, Rome, Naples, Pompeii, Vesuvius, Greece, the pyramids of Gizeh; returning to Venice and Vienna to spend the carnival there, and over Paris to New York.

"Prices $1,500, $1,200, $1,000, gold.

"Concerning the participation for four or five months, including excellent board, with wine, free entrance to all sights, partly to theatres and concerts, all drives in carriages, on horses, and in boats or gondolas; free guiding all during the voyage, free luggage, the use of tents, saddles, jars, and the escort of Bedouins, on the land-tour through Palestine.

"A courier, a physician, a lady companion for the ladies, and a servant speaking all forecoming languages, accompanying the party.

"Only first-class steamers and hotels will be frequented; the undertaking provides for every thing, and the greatest attention paid to ladies. Apply to

"Messrs. KUNHARDT & COMPANY,
"61 Broad Street, New York,
"Or at the Universal Excursion Company,
"Prescott House, 531 Broadway, New York."

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This company (well known in Europe) was present with two parties at the inauguration of the Suez Canal in Egypt, November, 1869. Excursions under their charge are made every year to Spain and Portugal; Norway, Sweden, and Russia; Italy, Greece, Turkey, Palestine, and Egypt, a trip up the Nile included; and special excursions twice a year to London, Paris, Vienna, and Venice, staying over the carnival. Doubtless in a few years these prices above will be regarded as fabulous. Competition has already commenced in the routes to the Pacific coast, as appears by the following:

"UNION PACIFIC RAILROAD.—Two hundred and twenty-six miles saved for Chicago by the Union Pacific Railroad, *via* Omaha. One hundred and thirty-five miles saved from Indianapolis. One hundred and seventeen miles saved from Cincinnati. Twenty-five miles saved from St. Louis to Salt Lake City, Sacramento, San Francisco, Sandwich Islands, New Zealand, Australia, China, Japan, and India. The best route to Denver, Colorado, New Mexico, and Arizona.

"Remember that only those tickets *via* Omaha are sure of places in the through Pullman palace cars. For sale at all the principal ticket-offices in the United States and Canada."

All this is the work of the locomotive, under the impulse of that powerful yet invisible offspring from two of the most conflicting elements brought within control, by the ingenuity of man, in the invention of the steam-engine, advanced as it now is to a stage of perfection in less than a century.

In the present improved state of this machine, it seems to be a thing almost endowed with human intelligence. It regulates with perfect accuracy and uniformity the number of its revolutions in a given time; it regulates the quantity of steam required to do its work; it opens and shuts its valves with absolute precision as to time and manner; it helps itself to all the water it

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wants; it oils its own joints, and, when any thing goes wrong which it cannot itself rectify, it gives timely warning to its attendant. Yet, with all these talents and qualities, and even when fully capable of exerting the power of six hundred or a thousand horses, it is obedient to the hand of a child. Its food is coal or wood, or any thing combustible; it consumes nothing when idle; it never tires or wants to rest or sleep; it is not subject to malady when originally made well, and only refuses to work when worn out with age; it is equally active in all climates, and will do work of any kind; it is a water-pumper, a miner, a sawyer, a tanner, a stone-cutter, a turner, a carpenter, a blacksmith, a cotton-spinner, a weaver, a sailor; in short, it is a mechanic in every branch of art. It has revolutionized the whole domain of human industry, and almost every year is adding to its power and its conquests. In our manufactures, arts, commerce, and our social accommodations, it is constantly achieving what, less than fifty years ago, would have been accounted marvellous or an impossibility; it can engrave a seal, and crush masses of the hardest metal like wax before it; draw out, without breaking, a thread as fine as gossamer, and lift a ship like a feather in the air! It can embroider muslin, and forge huge anchors; cut steel into ribbons, and impel loaded vessels against the fury of the wind and waves; and in the shape of a locomotive, or iron horse, it can now be seen daily and hourly dragging after it, on a railroad, hundreds of tons of merchandise and crowds of living freight, in the shape of men or animals, or an army of soldiers with all their munitions of war, at the rate of thirty miles or more an hour.

The locomotive, the most potent and at the same time the most perfectly controllable of all our mechani-

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cal agencies, has already been impelled at the flying speed of thirty, forty, and even sixty miles an hour; and if so much has been done already, it would be rash to say or conclude that this is to be its ultimatum. After the results of the last few years, we ask, has it yet reached its limits? No. Only as late as 1837 or '38, twenty-three years ago, the editor of a well-known and popular magazine in New York, the *Knickerbocker*, in noticing in its columns Parker's "Journal of an Exploring Tour beyond the Rocky Mountains," predicted the ultimate building of a railroad to the Pacific. After briefly extracting some of the scenes and interesting objects, together with the adventures described by the explorers, before and after crossing the "Black Hills," he thus writes:

"There would seem to be no insurmountable barrier to the construction of a railroad from the Atlantic to the Pacific. No greater elevations would need to be overcome, than have been surmounted on the Portage and Ohio Railroad. And the work will be accomplished. Let this prediction be marked. This great chain of communication will be made with links of iron. The treasures of the earth in that wide region are not destined to be lost. The mountains of coal, the vast meadow seas, the fields of salt, the mighty forests, with their trees two hundred and fifty feet in height, the stores of magnesia, the crystallized lakes of valuable salts—these were not formed to be unemployed and wasted. The reader is now living who will make a railroad trip across the vast continent.

"The granite mountain will melt before the hand of enterprise; valleys will be raised, and the unwearying fire-steed will spout his hot, white breath where silence has reigned since the morning hymn of young Creation was pealed over mountain, flood, and field. The mammoth's bone and the bison's horn, buried for centuries, and long since turned to stone, will be bared to the day by the laborers of the Atlantic and Pacific Railroad Company; rocks which stand now as on the night when Noah's deluge first dried, will heave beneath the action of 'villanous saltpetre;' and

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when the prairie stretches away 'like the round ocean,' girded with the sky, with its wood-fringed streams, its flower-enamelled turf, and its herds of startled buffaloes, shall sweep the long, hissing train of cars, crowded with passengers for the Pacific seaboard. The very realms of Chaos and old Night will be invaded; while in place of the roar of wild beasts, or howl of wild Indians, will be heard the lowing of herds, the bleating of flocks; the plough will cleave the sods of many a rich valley and fruitful hill, while from many a dark bosom shall go up the pure prayer to the Great Spirit."

The foregoing passage was copied at the time of its publication into one or two metropolitan daily journals, and, while its manner was courteously commended, it was pronounced visionary and absurd in its speculations; and yet, ere a dozen years had passed, such were the manifest improvements in railroads and locomotives, that the very ablest and most influential of these journals expressed its convictions that the time was close at hand when the nation would put forth its strength and commence the greatest and most important work ever devised or contemplated by man. A national railroad, designed to connect the inhabitants on our Atlantic border with our colonists lying on the coast of the Pacific; a national railroad traversing a vast continent, and passing over two thousand miles of wilderness still in the undisputed possession of the red-man, the buffalo, and the bear; a national railroad that shall become the highway of nations for the commerce of the Eastern world, and make New York its great depot; a national railroad, the cost of which will not fall much short of a hundred million dollars, and which will not really cost the nation one dollar, but increase its natural revenues more than five times its cost, by reason of the value it will impart to our public domain—such an enterprise is indeed a project worthy of the age in

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which we live. The subject was soon before the country; and our readers will admire with us the eloquence of Thomas H. Benton, the Missouri Senator, in his speech before the Pacific Railroad Convention held in St. Louis:

"We live in extraordinary times, and are called upon to elevate ourselves to the grandeur of the occasion. Three and a half centuries ago the great Columbus—the man who was afterward carried home in chains from the New World which he had discovered—this great Columbus, in the year 1492, departed from Europe to arrive in the East by going to the West. It was a sublime conception. He was in the line of success, when the intervention of two continents, not dreamed of before, arrested his progress. Now, in the nineteeth century, mechanical genius enables the great design to be fulfilled. In the beginning, and in barbarous ages, the sea was a barrier to the intercourse of nations: it separated nations. Mechanical genius, in inventing the ship, converted that barrier into a facility. Then land and continents became the obstruction. The two Americas intervening have prevented Europe and Asia from communicating in the straight line. For three centuries and a half this obstacle has frustrated the grand design of Columbus. Now, in our day, mechanical genius has again triumphed over the obstacles of Nature, and converted into a facility that which had so long been an impassable obstacle. The steam-car has worked upon the land, and among enlightened nations, and to a degree far transcending it, the miracle which the ship, in barbarous ages, worked upon the ocean. The land has now become the facility for the most distant communications, the conveyance being invented which annihilates both time and space. We hold the intervening land; we hold the obstacle which stopped Columbus; we are in the line between Europe and Asia.

"We have it in our power to remove that obstacle, to convert it into a facility, and to carry him on to his land of promise and of hope with a rapidity, a precision, and a safety, unknown to all ocean navigation. A king and a queen started him upon his great enterprise; it lies in the hands of a republic to complete it. It is in our hands—we, the people of the United States, of this first half of the nineteenth century. Let us rise to the grandeur of the

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occasion. Let us complete the grand design of Columbus by putting Europe and Asia into communication, and that to our advantage, through the heart of our own country. Let us give to his ships, converted into cars, a continuous course unknown to all former times. Let us make the iron road, and make it from sea to sea; States and individuals making it east of the Mississippi, the nation making it west. Let us now, in this convention, rise above every thing sectional, personal, local; let us beseech the national legislature to build the great road upon the great national line which unites Europe and Asia—the line which will find on our continent the bay of San Francisco at one end, St. Louis in the middle, the national metropolis and great commercial emporiums at the other; and which shall be adorned with its crowning honor, the colossal statue of the great Columbus, whose design it accomplishes, hewn from the granite mass of a peak of the Rocky Mountains, overlooking the road, the mountain itself the pedestal and the statue a part of the mountain, pointing, with outstretched arm, to the western horizon, and saying to the flying passenger, 'There is the East; there is India!'"

This has been consummated; and is it all that is to be? We answer, No! Almost every daily revolution of the earth upon its axis develops some new idea, some improvement upon what has already been accomplished in bringing the railroad and its auxiliary, the locomotive, nearer and nearer to a state of perfection. Within the last few years the construction of the narrow gauge has, as we may almost say, been conceived and sprung into existence, and, from experiments made, it has been demonstrated to a certainty to possess all the advantages that could have been conceived, even exceeding the most sanguine expectations of its projectors, and deciding its ultimate success.

The future improvement in the locomotive, when fully consummated, before another half century shall pass away, will confer upon man nearly as much new power and new enjoyment as if he were actually endowed with wings.

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The locomotive is truly the king of machines and a permanent realization of the genii of the Eastern fable, whose supernatural powers were at the command of man. When the next fifty years have rolled around, how little will men think of what we now call distance! The term will be obsolete in our vocabulary, and become entirely forgotten.

CHAPTER XLII.

LOCOMOTIVE-WORKS.

When we contemplate the progress made in locomotives within the last forty years, how forcibly comes to our mind the old but often the very truthful saying, "From small beginnings great results sometimes turn out!"

Let us look back to the year 1830, to Mr. Peter Cooper's experimental locomotive, the "Tom Thumb," and in the same year to Colonel Miller's contract to construct, for the South Carolina Railroad, a locomotive to perform at the rate of ten miles an hour, and draw fifteen tons' weight. This required, for construction, several months at the West Point Foundery Works. None of the beautiful machinery of the present day, for every department of mechanical labor, was then dreamed of, and the only tools at command were the rasp, the anvil, and sledge. Compare that work with the following description of one of the largest locomotive-works of the present day, and we are, as it were, lost in wonder and amazement. It is from

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the columns of a November number of the *New York World*, on the subject of locomotives, thus:

"Eighteen hundred men make a locomotive in one day—boiler, cylinders, frame, driving-wheels, truck, stack, cab, pilot, and tender complete—the speed of forty miles an hour, and the power of a thousand tons, created in a day.

"On the 25th of April, 1831, a miniature locomotive-engine, drawing two cars, with seats for four persons, was set in motion on a track laid in the rooms of 'Peale's Museum,' in the city of Philadelphia. Great numbers of people, not only from the city, but from distant parts, visited the museum to witness the performances of this wonderful machine.

"Previous to that date only three attempts had been made to the construction of locomotives by American mechanics. Two engines, the 'Phœnix'* and the 'West Point,' had been built at the West Point Foundery in 1830, for the South Carolina Railroad; and the third, the 'De Witt Clinton,' for the Mohawk and Hudson Railroad, was completed in the spring of 1831.

"Two locomotives had been imported from England, one in 1829, for the Carbondale and Honesdale Railroad, and another for the Mohawk and Hudson Railroad, in 1831.

"The little engine amusing the visitors at 'Peale's Museum' was the invention and work of Mr. Matthias W. Baldwin, then a skilful and enterprising mechanic of Philadelphia.

"In the following year (1831) Mr. Baldwin received an order from the Germantown Railroad Company for the construction of a locomotive-engine to run on their road. This was, at the time, a very formidable undertaking. Only one mechanic in America had yet succeeded in erecting a locomotive that would draw more than its own weight on a horizontal track. Several unsuccessful attempts had been made, resulting in loss and discouragement to the experimenters. Mr. Baldwin, however, had confidence in his ability to surmount all difficulties, and he agreed to build the engine. Without tools, patterns, or models, he entered upon the work, with only his genius to guide him, and on the 23d of November, six months after receiving the order, he placed the 'Ironsides' on the road. Its success and the sensation which it produced are now matters of history. It is enough to say that it established a

* The "Best Friend," name afterward changed to the "Phœnix."

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reputation for its builder that secured for him more work than the capacity of his shop could accommodate. Before the close of 1834 he had completed five engines. New shops were erected, and in 1835 fourteen locomotives were built, in 1836 forty, and in the next year forty-five. The business was, therefore, fully established, and grew from year to year, experiencing, with other departments of manufacture and trade, periodical revulsions, but yet moving forward, until the 'Baldwin Locomotive Works' assumed and maintained the enviable distinction of being the most extensive locomotive establishment in the world; and from the capacity of one small engine in six months, the works, within the third of a century, attained the capacity of one engine a day, or over three hundred of the most powerful and complete railroad locomotives in a year.

"One of the secrets of the great success of the works lay in the genius of the founder. Mr. Baldwin was gifted with a mind fertile in practical inventions to a degree rarely found in any country. During the earlier years of his experience as a locomotive builder, almost every engine produced was in some particular an improvement over any of its predecessors, many new devices or changes in combination giving increased strength, durability, and general efficiency to his machines. The Baldwin Locomotive Works are located on North Broad Street, Philadelphia, and occupy the greater part of three blocks, from Pennsylvania Avenue to Spring Garden Street, and an area of two hundred and forty thousand square feet. On the centre of the Broad-Street front stands the old shop erected by Mr. Baldwin in 1834. Here are the offices, store-room, and drawing-department, and in the Hamilton-Street shops the boiler-shop, smith-shop, brass-foundery, 'first, second, and third story machine-shops,' and pattern-loft. South of this was the Willow-Street shop, where cylinders and frames are finished, and tanks, trucks, stacks, and cabs, are made. Adjacent to this, on the west, is a building two hundred and sixty-six feet long, and sixty feet deep in the central part, and with two wings one hundred and eight feet deep at either end. The central part of the building and the east wing are used for the iron-foundery, where all the cast-iron work used about a locomotive, except the truck-wheels, is made. The west wing is used as a hammer-shop; one large steam-hammer, rated at five thousand pounds, is in constant use here, working up scrap and bar iron into blooms from which the engine-frames are made. On the north side, beyond

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Buttonwood Street, is the erecting-shop, whither all parts tend, and whence complete locomotives emerge.

"The different varieties of locomotives usually manufactured in this establishment are technically designated in the Baldwin classification by certain letters and numbers. The letters indicate the plan or kind of engine; the numbers the size and weight. The combination of the letters and numbers indicates precisely the class. To explain more clearly: The letter B is used to designate all engines having a single pair of drivers; C, those with two pairs of of drivers; D, those with three; and E, those with four pairs of drivers connected. Then certain numbers intended to designate the weight of the machine are joined with the letters, and the combination designates a particular plan and size of the locomotive.

"The ordinary type of the American locomotive, it is well known, is an engine of eight wheels, four of them under the fire-box part of the machine, and acting as 'drivers,' and four smaller wheels combined into a truck to carry the forward part of the engine. Such an engine, in the Baldwin technicology, would be a 'C' engine, by virtue of its having two pairs of 'drivers' connected. If the cylinders are sixteen inches in diameter, the boiler must be large enough to furnish them with steam, and all the other parts of the machine must conform in size. The aggregate weight of the engine is accordingly governed by the dimensions of the cylinders. In like manner all the other classes of engines are appropriately designated.

"A regular table of these rules and specifications is made out for the guidance of those who desire a locomotive constructed at these works, and from this table the customer makes his choice and gives his order, and, this settled and determined upon, the purchaser goes to his home or his business, and his order goes to the drawing department. Here the engine is, as it were, analyzed and dissected, the proposed machine existing as yet only in imagination and on paper, and must be composed, it is found, of a certain different number of parts.

"The smith-shop accordingly receives a written order, in a book provided for the purpose, to make the forgings; the foundery, the castings; the boiler-shop, the boiler; and so on. The several machine-shops also have their orders to fit up and finish these several parts which may come to them from the other departments. But, not only is the bare order to do the work thus made, the manner in which it is to be done is also provided for. Drawings

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and patterns are already in existence for every one of the parts to be constructed, unless the engine is of a class never before built. These drawings and patterns all have their separate distinguishing numbers. Each order for the production of any part, or for the finishing or fitting of it, bears also the number of the drawing or pattern to which the work is to be done. These order-books and necessary plans and patterns now go to the several departments, and, with the fulfilment of the orders which they communicate, must result all the parts required for the complete locomotive.

"Following these orders, we are led first to the boiler-shop. Here the sheets of iron or steel, as the case may be, are laid out. Both materials are now used for boilers, according to the preference of customers. The homogeneous cast-steel manufactured in this country, and which has come into use within the past few years, gives a metal, for fire-boxes and boilers, which is surpassed by no other yet used for the purpose. To the credit of American manufacturers it may be said, moreover, that for these uses the homogeneous cast-steel plates manufactured in the United States are superior to any steel that can be imported. The steel plates used for boilers are five-sixteenths of an inch thick, iron plates are three-eighths. The former, though thinner, give, on account of the superior character of the metal, a tensile strength about thirty per cent. greater than the five-eighth-inch iron plates. For the boxes, steel has now almost entirely superseded all other metals. For boilers, it is gradually but steadily coming into use. The first cost for a steel boiler is from two hundred and fifty to five hundred dollars greater than for iron, but the superior strength and durability of those made of steel plates fully warrant the expenditure, in the judgment of many railroad officers.

"Before being put into a boiler, every sheet, whether of steel or iron, is carefully tested, and the slightest flaw or imperfection in the metal is at once detected by the expert who devotes his whole attention to this important duty. If tried and not found wanting, the great jaws of steam-shears cut them to the required size; four great flange-fires then receive them, where they are softened so as to be pressed and beaten into the proper curve; the steam punching-machine, or the drilling-machine, as the case may be, perforates the edges with holes of the exact size, form, and equidistant; then, with hammer and tongs, the sheets are tacked together by an occasional rivet, a powerful crane takes the skeleton up and delivers it to the steam riveting-machine, where every

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rivet is clinched under three strokes of sixty thousand pounds each. The precision and power with which this machine does its work is a marvel of mechanical skill.

"The fire-box, having gone through a similar process, now meets the 'shell of the boiler,' and the two are joined firmly together by screw stay-bolts. The waist or cylindrical part is then attached, and the boiler is complete. It is placed upon wheel-trucks and sent over a track to the erecting-shop.

"In the same time that it requires to do this work in the boiler-shop, by an exact distribution of force, the workmen in the foundery have drawn the liquid metal from their roaring furnaces, have cast it into forms for cylinders, driving-wheel centres, chests, valves, etc. These, received in the Willow Street machine-shop, have been bored, planed, heads turned and ground to a perfect fit, and, as complete cylinders and steam-chests, are sent to the erecting-shop. The drivers are sent from the foundery to the first-floor machine-shop. The axles, forged under a heavy steam-hammer, are delivered to the same place. The tires for many of these drivers are made at 'the William Bulcher Steel Works' at Newtown, and are pronounced by competent judges equal to the best imported. Seven thousand have been in use for several years, and give entire satisfaction. Note this fact to the credit of American steel manufacture. The crank-pins are received in the rough from the Baldwin and Liveszey Steel Works, Frankford. In the machine-shop the tires are bored and sunk in the centres of the drivers; the axles and pins are turned; the tires are shaved down to exact equality of size; the axles and crank-pins are forced into the wheels by hydraulic pressure of from twenty to eighty tons, and the drivers complete are sent to the erecting-shop. The truck-wheels go through the same process, and are sent to the erecting-shop.

"Under the ponderous strokes of a steam-hammer of two and a half tons' power, great iron frames are forged out, and pedestals are welded to them under the same weight. These frames are roughly dressed up by hand in the smith-shop; they are then taken to the Willow-Street shop, where they are planed, stolled, drilled, and completed in every part. The 'frame' is the basis, or foundation, to which all the parts of the locomotive are bound; it, too, is sent to the erecting-shop. Meantime the trucks, smoke-stacks, cabs, and tenders, have been made in their respective departments and are ready for the engine proper.

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"We will now describe the erecting-shop, that general receptacle where all parts are received, and whence issue complete locomotives destined for all parts of the continent. Here, in an area of one hundred and sixty-eight feet long by one hundred and forty wide, under an arched roof, netted with steam-pipe, water-pipe, and suspended trucks, the parts prepared in other departments of the establishment are brought together. Boilers, cylinders, frames, guides, crossheads, drivers, and other articles innumerable, are here tossed together in what, to the unpractised eye, seems inextricable confusion. On closer inspection it is found that every article has plainly marked upon it the letter and number of the engine of which it is to form a part. We find here twenty or more boilers mounted on trestles, gangs of men at work managed by as many master-mechanics, under the direction of the foreman of the shop, the whole under the supervision of the superintendent of construction. To these boilers the parts are brought and attached; and, what is most marvellous, here are bolts made in one part of the works to be inserted into holes made in another; bars, screws, pins, yokes, etc., fit to such exactness that the thinnest film of oil is an obstruction. The wonder is how such absolute precision is possible in an establishment employing nearly two thousand men, distributed throughout different shops. Upon expressing surprise at this circumstance, we were taken to the department of 'standard measurements.' There we saw gauges made of hardened steel for the measurement of every fraction of an inch, gauges for turning bolts, for boring holes, for cutting threads or screws, for planing surfaces; gauges for reamers, for cross-heads, for bolts and bolt-heads. Also calipers for every length of inside and outside measurement required in the work. Each department is supplied with a complete set of these gauges and calipers required for the measurement of parts made therein; and these are carefully inspected and compared with the standard, once a week, by the superintendent of this department. There is, thus, no excuse for any workman who makes his bolt, bar, or screw, too long or too short, too thick or too thin, and such blunders are exceedingly rare. This is the clew to the marvellous exactness in all the work. If an engineer in Oregon should telegraph to the Baldwin Locomotive Works that the piston-rod or the cross-head of locomotive No. 2,300 is broken, a duplicate, certain to fit with absolute exactness, could be forwarded at once.

"The system of standard gauges, together with the plan of

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doing all work to drawings or patterns, explains why an establishment of its size can not only build so many engines in a year, but can turn out machines in which the parts are so accurately finished and absolutely interchangeable. A complete system and thorough subdivision of work reveal the secret. The same gang of men under the same foreman works from one year's end to another on the same work, as fitting up rods, boring out and finishing cylinders, fitting the valves, or putting the engine together when all the parts are completed. Each man, having only his specialty to attend to, becomes thoroughly an expert at its details, and can do his work better and faster for this very reason. In fact, the very quality of the work produced in itself conspires to exactness in all the details, by making possible a complete system and thorough subdivision of labor.

"But from this digression let us return to the erecting-shop. One of the gangs has carried the erection of the engine under its charge to that point where trial is made. No boiler is riveted perfectly steam-tight under the first process. Each undergoes inspection, first under water-pressure, so as to detect leaks, and after that under steam-pressure, so as to insure strength. This duty in the Baldwin Works is committed to an expert who, by many years' experience, has acquired such perfect knowledge in his specialty as to make it, humanly speaking, impossible that any imperfection of construction should escape his detection. Strength and tightness are thus secured in all the boilers. The parts are finally connected, a strong puff of steam is sent through the pipes, valves, cylinders, and escapes, so as to blow out any iron-filings, chips, or other loose matter. The cylinder-heads are then bolted to the cylinders. The men lay hold of the drivers and turn them two revolutions forward and backward, to ascertain whether any obstructions exist. Finally, steam conveyed through pipes beneath the roof is let on, the valves are opened, and the drivers revolve, at first slowly, then at fair 'service speed.' The inspector is again present; he lays his finger on the piston-rod, connecting-arms, drivers, and cylinder-heads, and, feeling the pulse of the new machine, detects the slightest jar, tremor, or irregularity in motion, and orders the correction with infinitely more exactness than the most skilful practitioner discovers and cures the disorders of the human patient. The locomotive is then pronounced complete, it is so entered upon the books of the firm; the trestle-work is then removed, and the engine is lowered by means of

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powerful 'jacks' to the track on the turn-table, whence it is run out on the siding of the Reading Railroad, to be shipped to the place designated by the purchaser.

"During the past twelve months two hundred and seventy-one complete locomotives have been sent from this shop, as follows: in October, 1869, twenty-two; in November, twenty-six; in December, twenty-two; in January, 1870, twenty-one; in February, twenty-one; in March, twenty-one; in April, twenty-one; in May, twenty-eight; in June, twenty-eight; in July, twenty-eight; in August, twenty-four; in September, twenty-four. This is a decided progress from the five engines turned out by Mr. Baldwin in 1835. But the progress which has been made in the methods of construction, resulting in increased efficiency, strength, speed, economy in fuel and repairs, is no less wonderful. The archives of the establishment, containing, as they do, communications covering a period of thirty-five years, and in the handwriting of railroad managers, engineers, and master-mechanics, are not only a reflex of the general progress of railroad practice, but bear strong testimony to the efficiency, and durability, and superior workmanship, for which the Baldwin engines have secured an enviable reputation.

"Mr. Baldwin conducted the business of locomotive-building from 1831 to 1839. Messrs. Vail and Hufty then became associated with him. In 1841 Mr. Hufty retired, and was followed soon after by Mr. Vail. Mr. Baldwin was now left alone in his business, but in 1842 was joined by Mr. Asa Whiting, who continued in the firm until 1846, when he retired to engage in the manufacture of car-wheels. From 1846 to 1854, Mr. Baldwin was again the sole proprietor of the works. In 1854 he connected in the firm Mr. Matthew Baird, a practical mechanic, who had been connected with the establishment since 1836.

"Mr. Baldwin died in 1866, when the establishment was reorganized under the name of the 'Baldwin Locomotive Works,' Messrs. Baird & Co., proprietors. Subsequently, several enterprising and practical men united their interests with the company. The firm now consists of Messrs. Matthew Baird, George Burnham, Charles T. Parry, Edward H. Williams, W. P. Heneszey, and Edward Longstreth. In these gentlemen we have six active, practical, experienced men, each in charge of a department of operations of which he thoroughly understands all the *minutiæ*. Under these there are private secretaries, book-keepers, draughts-

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men, assistants, bosses, and watchmen, who see that orders are delivered and obeyed with precision and dispatch. This explains why, in so large an establishment, doing a business so extensive, machines are produced so uniform in quality and so satisfactory in service.

"We cannot leave this subject without a word of comment on the lesson it teaches, as to the value of American manufactures and the importance of protecting them.

"Here is an establishment, the value of the finished products of which, in 1869, was $3,430,018.84. Of this sum, $1,068,388.20 was expended for labor, giving employment to sixteen or seventeen hundred men, and, if we allow five persons to a family, furnishing a support for a population of eight to nine thousand souls—no inconsiderable portion of the population of Philadelphia. But further, the remaining two and a half millions represent the amount expended for materials, for tools, for railroad, canal, and steamer freights, for the innumerable incidental expenses of carrying on such a business, and for the return on the capital invested. But of this expenditure for material bought and used in the manufacture of locomotives, all, without an exception, save some few articles not produced in this country, are exclusively American products or American manufactures. American boiler-plate, American steel, American bar and pig iron, American lumber, American coal, American copper, and American brass, are the principal materials from which the Baldwin Locomotive Works constructed their machines. All these articles, as they come to the works, represent in their cost price principally labor, and American labor at that—labor in mining coal, in smelting iron, in rolling boiler-plate, in cutting and sawing lumber, etc. If we go back to the absolute first cost, or the royalty, for the coal and ore in the ground, and the lumber in the forests, as we logically may, we shall have but a few thousand dollars as the original first cost for the raw material, which mined, smelted, cast, forged, planed, turned, finished, and polished, stands finally on the books as an aggrerate value of nearly three and a half million dollars, and in its various stages of transformation and progress has given employment to probably six thousand men, and supported a population of thirty thousand souls."

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CHAPTER XLIV.

PAST, PRESENT, AND FUTURE.

We will now close our work with the following interesting article upon the railroads of the present day, and their prospects for the future, which we take the liberty of copying from the New York *Independent*, with some few omissions. The article reads thus:

"No fact has had a wider influence upon the business and material progress of this country than the growth of railways within the last forty years. In 1829 there was scarcely a single mile of railway in all the land; and in 1830 only twenty-three miles of line were opened. In 1848 we had five thousand nine hundred and ninety-six miles of line completed, showing an average increase of three hundred and ten miles per annum, from the commencement. In 1860 the system had expanded to thirty thousand six hundred and thirty-five miles, advancing, for the previous twelve years, at the annual rate of two thousand and fifty-three miles. The war greatly retarded this progress, especially at the South; and yet the aggregate addition, up to the end of 1868, was eleven thousand six hundred and forty-nine miles in eight years, averaging one thousand four hundred and fifty-five miles for each year, and giving a total of forty-two thousand two hundred and fifty-five miles for the whole country. In 1868 the increase was two thousand nine hundred and seventy-nine miles; which, with one exception, was greater than the increase of any previous year. During the past year the estimated increase is five thousand miles. Since, and including the year 1865, the year when the war closed, about thirteen thousand miles of railway have been constructed. The total mileage, as the figures now stand, amounts to forty-seven thousand two hundred and fifty-five miles.

"On January 1, 1869, the six New-England States had four thousand and nineteen miles of railway, the six Middle States had nine thousand seven hundred and sixty-five miles, the ten Western States had sixteen thousand eight hundred and eighty-nine miles,

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the twelve Southern States had ten thousand six hundred and ninety-three miles, and the three Pacific States had eight hundred and eighty-nine miles of road. Pennsylvania was the 'banner' State as to railroad mileage—having four thousand three hundred and ninety-eight miles on January 1, 1869. Illinois stood next on the list, having three thousand four hundred and forty miles; and Ohio and New York were about equal, each having about three thousand four hundred miles. In proportion to the number of square miles of territory, Massachusetts was far in advance of any other State, having one thousand four hundred and fifty miles of road to seven thousand eight hundred square miles, or an average of one mile of road to every five hundred and forty-seven square miles—a ratio which, if extended to the whole United States, would give six hundred thousand miles of railway. The cost of all these roads, as compiled at the close of 1868, was set down in round numbers at $1,850,000,000. Add the cost of the roads completed in 1869, at an average of forty-four thousand dollars per mile, and we have a total cost of $2,070,000,000, an amount nearly equal to the national debt. The aggregate tonnage of these roads in 1868 was about seventy-five million tons, valued at $10,472,250,000. This is equal to about six times their cost, and would pay four such national debts as the country now owes.

"The year 1870 opens with an exceedingly brilliant promise for railway progress. The *American Railroad Journal* for December 25, 1869, informs us that about three hundred enterprises of this character are now under way, and that in the course of the next two or three years they will be completed, adding some fifteen thousand miles more to the railroads of this country, to say nothing of others to be undertaken during this period. Some of these roads are hundreds of miles in length, tapping fertile and rich districts of country, bringing them within easy reach of the great markets of the land, leading to a very rapid increase of population, and adding millions upon millions to the wealth of the nation.

"Commissioner Wells, in his recent report, observes: 'If it is assumed that a line of railway gives access to fifteen square miles of country on each side of it, or thirty square miles altogether, then the thirteen thousand miles of railway which it is estimated have been constructed during the five years from 1865 to 1870 will have opened up three hundred and ninety thousand miles of what, for the purposes of general production, may be considered new

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territory—a tract of country larger than the whole area of France, and nearly three and a half times larger than the whole area of Great Britain.'

"Not only in the item of mileage, but also in construction and accommodation, has there been a great progress in our railway system. Much better roads are being built than were formerly deemed necessary. Steel rails are taking the place of iron rails. The roads are much better equipped than formerly; more safeguards are provided against accidents, and fewer accidents occur in proportion to the amount of travel. Railway capitalists have discovered the folly and poor economy of hasty and imperfect construction, which, though cheaper at first, is more costly in the end. The multiplication of roads and their healthy competition with each other, have had a tendency to reduce their rates of fare and freight charges, and in this way serve the interest of the community. Indeed, all the facts and statistics of the great railway interests of the country greet the new year with an exceedingly inviting prospect for the future. The progress of the past, wonderful as it seems, will be entirely eclipsed by that of the next forty years."

The July number of *Lippincott's Magazine* gives another encouraging view of the future prospects of business and commerce from the progress of the railroad system, now daily verified, thus:

"Future of the Lake Trade.—The time is not far distant when vessels laden with minerals from the Lake Superior mines, Iowa, Dakota, and all the Northwestern States, even from California, will pass through Lake Superior City, Duluth, and other ports, direct to Liverpool, England. And the sight of this is not going to be reserved for the next generation; we are going to see it, and right soon. A net-work of railways will soon spread over this vast territory, from Lake Superior to the Pacific coast, and towns and cities rise along every line.

"The St. Paul and Pacific Railroad is now penetrating toward Lake Winnipeg, into Selkirk settlement, where the fires of revolution have recently kindled. The Lake Superior and Mississippi Railroad will soon unite the Mississippi River and Lake Superior. The Northern Pacific Railroad Company are at peesent vigorously pushing their road from Duluth to the Red River, at the western

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boundary of Minnesota. This road, as soon as possible, will cross the Red River, and pass on to Puget's Sound, and also to Portland, Oregon. Few people who have not been up here have more than a faint conception of the fertility of this belt of the great Northwest. It is a magnificent country; its climate is delightful; its agricultural resources are superb; it is large and wealthy enough to become in itself, if separated by an ocean from the rest of the world, one of the greatest of nations, with a government of the highest rank. But it is not isolated in its greatness. It is a vital member of the Union, and is abont to prove itself to be the one possessing the most vigorous vitality. It is not one of the extremities of the domain of the Union, but is, in fact, the great vital centre, having for one arm the Southern States down to the Gulf, and for the other British America up to the North Pole."

THE END.

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Nathan & Dreyfus,

SOLE MANUFACTURERS

OF

NATHAN & DREYFUS'

PATENT SELF-ACTING

Lubricators & Cups

FOR

Locomotive Steam Chests,

CONNECTING RODS, GUIDES, ECCENTRICS,

AND

SMALL CONNECTIONS,

No. 108 LIBERTY STREET,

NEW YORK.

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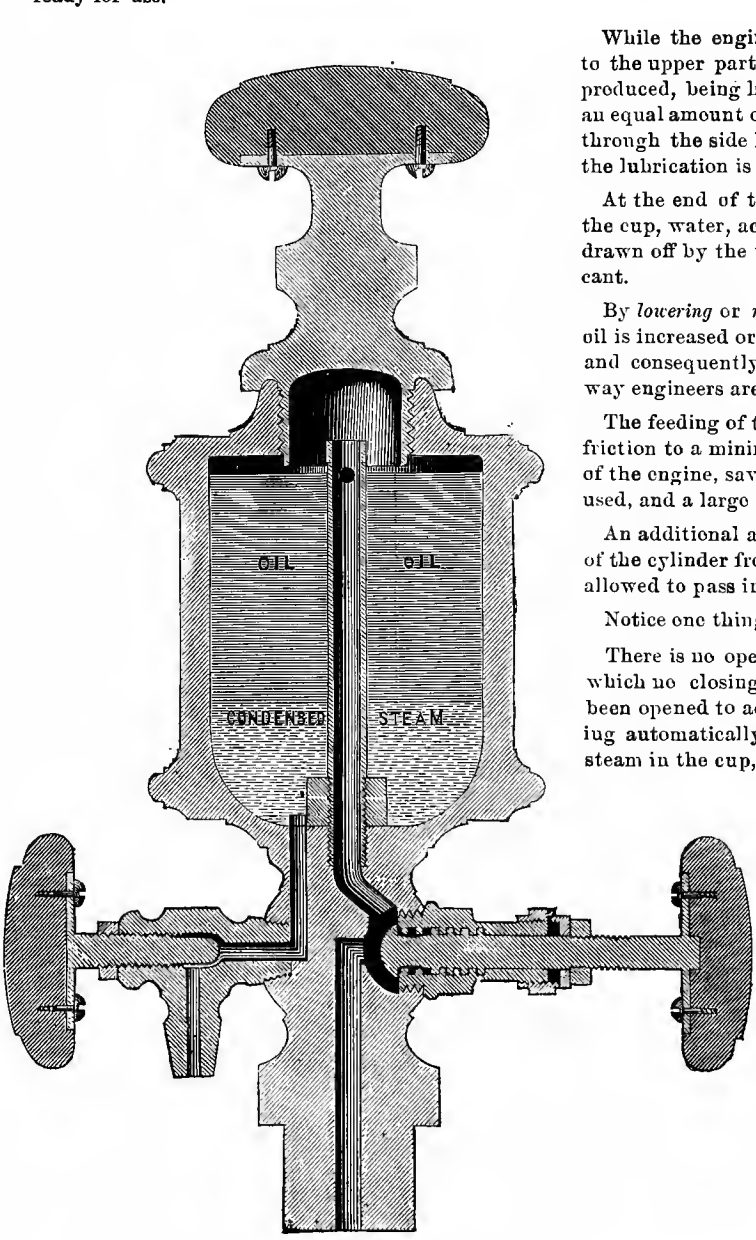
PATENT SELF-AC

DIRECTION

Screw the Cup on the top of the Steam Chest or on the Steam Pipe
Fill it with Oil or melted Tallow up to the side hole of the inside tube, then open the
ready for use.



While the engine is in motion,
to the upper part of the Cup whe
produced, being heavier than the
an equal amount of the lubricant
through the side hole near the to
the lubrication is required.

At the end of the day, or when
the cup, water, acids and other im
drawn off by the waste cock, and
cant.

By *lowering* or *raising* the tube,
oil is increased or decreased, hence
and consequently more or less oi
way engineers are enabled to cont

The feeding of the cup being co
friction to a minimum, the effect
of the engine, save about three-fou
used, and a large amount of Packi

An additional and important ad
of the cylinder from corrosion, as
allowed to pass into the cylinder.

Notice one thing:

There is no opening at the bott
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been opened to admit the steam t
ing automatically accomplished
steam in the cup, while the engine

FOR LOC

The perfect lu
gives to the Eng
control of the th
required, and
easier pull.

In fact it has
that an engine fu
will pull 2 or 3
than usual. Th
produced reduce
working parts v

RELIABILITY
UNEQU

PRICE

Size,	1	1½	2	
Plain, - -	$4	$6	$8	$

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NG LUBRICATORS.

FOR USE.

PATENT, OCTOBER 27TH, 1863, AND JANUARY 19TH, 1870.

about one quarter and it is

steam passes up the Tube condenses, and the water so nks to the bottom and lifts top, causing it to overflow the Tube to the parts where

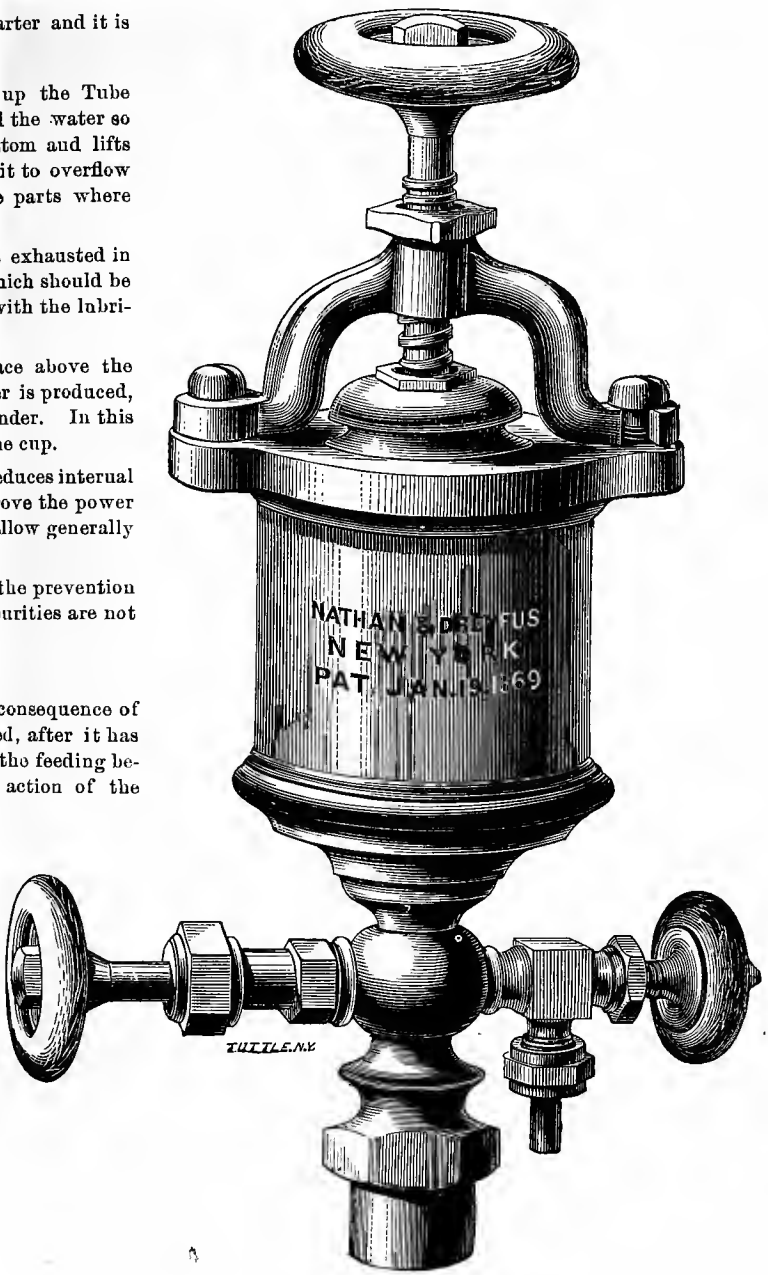
oil or tallow is exhausted in ses remain, which should be up be refilled with the lubri-

ndensing space above the e or less water is produced, il to the cylinder. In this e feeding of the cup.

and regular reduces interual ich is to improve the power of the oil or tallow generally

ge gained is the prevention and other impurities are not

the cup, in consequence of ilve is required, after it has up the tube, the feeding be- condensing action of the motion.



TIVES.

tion obtained immediate valve when command an

ascertained ed with them (freight) more action thus wear of the siderable.

ECONOMY RED!

LIST.

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12	$16				
20					

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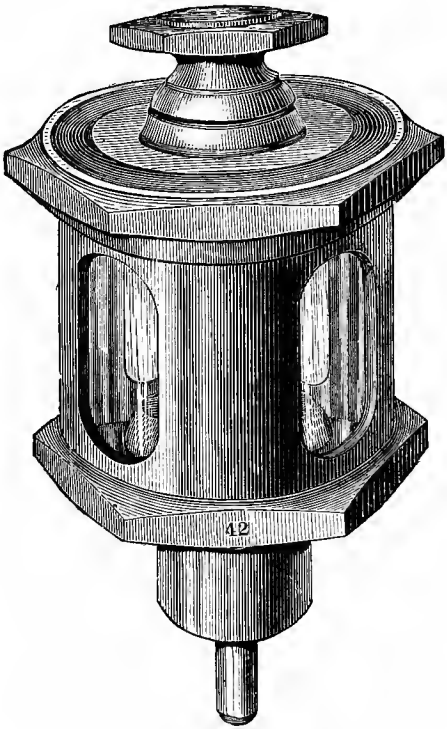
Dreyfus' Patent Locomotive Cups.



LOCOMOTIVE CUPS.

DESIGN PATENTED MARCH 30, 1869.

Are shell-cased, made very ornamental, constantly exposing the oil to view, and are generally considered the best ever used.

	CAPACITY.	DIAMETER.	HEIGHT.	PRICE PER DOZ.
No. 28—Shell Case, for small connections, .	½ oz.	1½ in.	2½ in.	$36 00
" 36— " Eccentrics, ...	1 "	2 "	3½ "	48 00
" 42— " Connecting Rods, .	1¼ "	2 "	4 "	48 00
" 42— " Guides with Steel Spindle and Spring, ...	1¼ "	2 "	4 "	48 00
No. 43—Shell Case, Regulators with Valve and Set Screw, to feed as required, .	1¼ "	2 "	4 "	56 00

The rod Cups will run from fifteen to eighteen hundred miles with one filling, and the Guide Cups seven hundred miles with one filling.

[For Locomotive Guides, without Regulating Valve.]

Permit the spindle to extend below the Guide far enough to allow the Cross-Head to strike it, and round the end so that the Cross-Head will strike it in the centre.

After properly adjusting the Guide Spindle (as above directed), have them taken out and hardened to a degree that will prevent them from wearing.

Munroe & Metz, Pr's, 60 John St., N. Y.

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